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REPORT AND DECISION ON REVIEW OF PLAN FOR PRORATION OF OIL TO MARKET DEMAND IN ALBERTA

JULY 1964

Alta

OIL AND GAS CONSERVATION BOARD

603 SIXTH AVENUE SOUTH WEST • CALGARY, ALBERTA

REPORT AND DECISION ON REVIEW OF
PLAN FOR PRORATION OF OIL TO MARKET DEMAND
IN ALBERTA

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IN ALBERTA

- 10 Strike out the definition of "Allocation factor" with "Allocation factor - The ratio of the provincial allowable to the sum of the allowable shares of all the pools in the Province".
- 21 8 Strike out the words "these pools" and substitute therefor the words "pools discovered prior to Leder Woodhead".
- 21 13 After the words "designated fields" add the words "and minor oil accumulations in gas fields".
- 22 With respect to the Tobacco Canada proposal: ".125 Billion" should read ".125 Billion".
- 22 16 "decline" should read "declines".
- 115 200 "superfluous" should read "superfluous".
- 115 201 "regulation" should read "regulators".
- 120 1000 After the word "period" insert "involves, for each pool, calculating an 'economic reserve' as determined by the economic allowance and then subtracting the 'economic reserve' from the ultimate reserves less one-half the cumulative production. The final step is determining the 'economic reserve'."

OIL AND GAS CONSERVATION BOARD

603 SIXTH AVENUE SOUTH WEST • CALGARY, ALBERTA

REPORT AND DECISION ON REVIEW OF
PLAN FOR PROPORTION OF OIL TO MARKET DEMAND
IN ALBERTA

JULY 1964

OIL AND GAS CONSERVATION BOARD

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PLAN FOR PRORATION OF OIL TO MARKET DEMAND
IN ALBERTA

E R R A T A

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61	8	Strike out the words "these pools" and substitute therefor the words "pools discovered prior to Leduc Woodbend"
61	13	After the words "designated fields" add the words "and minor oil accumulations in gas fields"
88		With respect to the Texaco Canada proposal: ".125 bls/acre/" should read ".125 bbl/acre/"
89	18	"decline" should read "declines"
110	2nd last	"superflous" should read "superfluous"
133	16	"regulation" should read "regulations"
165	last	After the word "period" insert "involves, for each pool, calculating an 'economic reserve' to correspond with the economic allowance and then subtracting the 'economic reserve' from the ultimate reserves less one-half the cumulative production. The first step in determining the 'economic reserve' "

July 24, 1964

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I INTRODUCTION

Since December, 1950, the Oil and Gas Conservation Board has each month issued an order fixing a provincial allowable for oil in accordance with the market demand and prescribing how much oil may be produced from each pool and from each well to satisfy the provincial allowable. Such a process is commonly referred to as "proration of oil to market demand" or simply "proration" or "prorating".

The institution of this three-step method of proration in Alberta followed the enactment in 1949 and 1950 of legislation authorizing its use. The legislative provisions were drafted with consideration being given not only to administrative practices in this jurisdiction but also to sources in the United States. The development of prorating to market demand in the principal oil producing areas of the United States was part of a great development in oil and gas conservation in the early Thirties. An obvious result was the prevention of surface waste caused by production exceeding market requirements. Prorating was also considered important in preventing underground waste as in its absence there had been marked variations in withdrawals and pressure differentials between different parts of a pool. Finally market proration was considered important in these states as a means of protecting "correlative rights".

The first major reconsideration of the Alberta proration plan was made by the Board in 1957. Between 1957 and 1963 it made no major review of its methods of prorating to market demand. Toward the end of that period, however, the need of a review was more than once broached during meetings of the Board with industry representatives and with oil company officials, and finally the Board received a written request for such a review from Pan American Petroleum Corporation. Consequently, the Board decided that a hearing should be held during November, 1963, and in January, 1963, preparatory to calling the hearing, it approached industry, through the Canadian Petroleum Association and the Independent Petroleum Association of Canada, to obtain its views on the scope of the hearing.

Notice of the hearing was issued on March 11, 1963. It provided for the filing on or before July 31 of a submission for presentation at the hearing by any person who wished to do so and for the filing on or before September 27 of a response to the primary submissions by any person who wished to file such a response. The notice stated that the Board would hear representations respecting the allocation of that portion of the provincial allowable for oil not supplied by synthetic crude oil from the oil sands⁽¹⁾ and specifically the allocation to pools and wells of those portions of the provincial allowable to be supplied by:

(1) Athabasca oil sands and sands of a like nature elsewhere in the Province.

- (a) condensate or pentanes plus recovered as a result of the production and processing of gas for market or the cycling of gas-condensate pools,
- (b) black or heavy crude oil,
- (c) light and medium crude oil from pools not now subject to prorating, and
- (d) light and medium crude oil from pools now subject to prorating.

Further, the Board would receive representations on the qualification of wells for an allowable and whether or not the maximum permissive rate (MPR) or the maximum efficient rate (MER) of pools or wells should be a factor in the allocation. Further, the Board would hear representations concerning the method of introduction of, and the transition to, any new plan of allocation. However, the Board stipulated that it would not hear representations concerning the methods of fixing MPR's or MER's representing the maximum rates at which pools or wells may produce under conditions where they are not restricted to market demand.

In this report the Board will examine the representations received at the November hearing and in the light of such representations and its own knowledge will settle upon a plan of proration which will apply in the coming years.

Appearances

The following presented primary submissions and most of them also presented responses:

<u>Submission by</u>	<u>Represented by</u>	<u>Witnesses for</u>	<u>Abbreviation of names used in report</u>
Pan American Petroleum Corporation	N.J. Stewart S.B. Richards	S.B. Richards	Pan American
The British American Oil Company Limited	J.A. Strand J.B. McDonald	J.B. McDonald	British American
The California Standard Company	A.B. Bristow, Jr.	I.M. Six	California Standard
Great Plains Development Company of Canada Limited	P.Podmaroff G. Little	P.Podmaroff	Great Plains
Hudson's Bay Oil and Gas Company Limited	C.C. Frye	C.C. Frye	Hudson's Bay
Imperial Oil Limited	D.E. Lewis, Q.C. R.Horsfield P.Nettleton	W.D.C.Mackenzie R.Horsfield J.W. Flanagan	Imperial
Independent Petroleum Association of Canada	C.M. Leitch M.E. Lomas M.P. Paulson	M.P. Paulson A.H. Ross R.R. McDaniel W.J. Murray, Jr.	IPAC
Dome Petroleum Limited	C.S. Dunkley M.D. McElroy	C.S. Dunkley	Dome
Union Oil Company of Canada Limited	E.J. Connor	E.J. Connor	Union
Western Decalta Petroleum Limited	A.H. Ross	A.H. Ross	Western Decalta
National Petroleum Corporation Limited	G.A. Hill	G.A. Hill	National Petroleum
Shell Canada Limited	J.M. Killey	A.L. Bordula	Shell
Socony Mobil Oil of Canada, Ltd.	D.W. MacFarlane	P.J. Hoenmans	Socony Mobil

<u>Submission by</u>	<u>Represented by</u>	<u>Witnesses for</u>	<u>Abbreviation of names used in report</u>
Sun Oil Company	A.D. Brown	A.D. Brown	Sun
Texaco Canada Limited	W.C. Howells	W.C. Howells R.F. Cummer	Texaco Canada
Texaco Exploration Company	M.P. Robinson R. Pike	M.P. Robinson R. Pike	Texaco Exploration
James A. Lewis Engineering Company Ltd.	J.E. Michaud	J.E. Michaud	Lewis Engineering

In addition to the above, the following presented responses or appeared for the purpose of cross-examination or argument:

<u>Response or Appearance by</u>	<u>Represented by</u>	<u>Witnesses for</u>	<u>Abbreviation of names used in report</u>
Alcon Petroleums Ltd.	H.M. Hotchkiss W.A. Howard	W.A. Howard	
Amerada Petroleum Corporation	R.P. Cummer	R.P. Cummer	Amerada
Banff Oil Ltd.	J.C. Rudolph	J.C. Rudolph	
Calgary & Edmonton Corporation Limited	J. Peake W.B. MacInnes	J. Peake	C & E
Canadian Devonian Petroleums Limited	J.A. Downing	J.A. Downing	
Teck Corporation Limited	J.A. Downing	J.A. Downing	
Canadian Fina Oil Limited	R. Pot	R. Pot	Canadian Fina
Canadian Home- stead Oils Limited	M.M. Holgate	M.M. Holgate	

<u>Response or Appearance by</u>	<u>Represented by</u>	<u>Witnesses for</u>	<u>Abbreviation of names used in report</u>
Castle Oil & Gas Limited	M.M. Holgate	M.M. Holgate	
DeKalb Petroleum Corporation	C.M. Heglin	A.P. Tiddens	DeKalb
Home Oil Company Limited	M.P. Paulson	M.P. Paulson	Home
Pacific Petroleum Ltd.	G.D. Nickoloff G. Laed	G.D. Nickoloff	Pacific
Prairie Oil Royalties Ltd.	G.S. Brant	G.S. Brant	
Skelly Oil Company	G.O. Selinger	I. Ruus	Skelly
Supertest Petroleum Corporation Limited	M.E. Shannon R.H. Laurence A.J. Miller	R.H. Laurence A.J. Miller	Supertest
Tenneco Oil & Minerals Ltd.	J.R. Knight	J.R. Knight	Tenneco
Triad Oil Co. Ltd.	J.R. Lacey	J.R. Lacey	Triad
Whitehall Canadian Oils Limited	J.B. Ballem	W.A. Elser	Whitehall
Trans-Canada Pipe Lines Limited	A.E. Potter		
Husky Oil Canada Ltd.	J.L. Smith		
Champlin Oil Company Limited	E.H. Balch T.J. Duckworth		
French Petroleum Company of Canada Limited	P.D. Gelpke		

<u>Response or Appearance by</u>	<u>Represented by</u>	<u>Witnesses for</u>	<u>Abbreviation of names used in report</u>
Dennison Mines) Limited)			
Peruvian Oils &) Minerals, Limited)			
Luscar Coals) Limited)			
Sunshine Mining) Company)			
Zenmac Metal) Mines Limited)	A.H. Mitchell	A.H. Mitchell	
Mitchell &) Associates)			
Limited)			
National Bulk) Carriers)			
Incorporated)			
Basin Oil) Exploration)			
Limited)			
Donalex Invest-) ments Limited)			
Pirot Explorations) Limited)	W.L. McDonald		
Tivio Oil & Gas) Limited)			
Western Canada) Explorers Limited)			
Whiterock Explor-) ations Limited)			
Whiterock Invest-) ments Limited)			
Numac Oil & Gas) Limited)	W.S. McGregor		
Alminex Limited)	P.H. Powers	P.H. Powers	
Canadian Superior) Oil Ltd.)	L.R. Miskew		
Canadian Chieftan) Petroleums Ltd.)	S.A. Milner	S.A. Milner	
Tidal Petroleum) Corporation Ltd.)	S.A. Milner	S.A. Milner	

<u>Response or Appearance by</u>	<u>Represented by</u>	<u>Witnesses for</u>	<u>Abbreviation of names used in report</u>
Canadian Kewanee Limited	K.S. Blancett	K.S. Blancett	
Camerina Petro- leum Corporation	H. Dernick	H. Dernick	
Consolidated East Crest Oil Company Ltd.	R.G. Price	R.G. Price	
Hvlo Gas Producers Ltd.	L.F. Grumbly	L.F. Grumbly	
Penwa Oils Ltd.	C.M. Leitch	M.P. Paulson	
Suffolk Oil & Gas Ltd.	A.C. Perry	A.C. Perry	

Most of those who participated at the hearing are companies operating oil producing properties in the Province. IPAC, however, is an organization of operators and others interested in the oil industry, particularly those other than the major integrated operators. It claimed that most (110) of its members supported the IPAC position, that three of its member companies, however, Devon-Palmer Oils Ltd. (Triad), Great Plains and National Petroleum made separate submissions, and that of the rest, eight took no position and a few members (16) such as some of the banks were not approached by IPAC regarding the matter.. Primary submissions were also received from four member companies listed as supporting IPAC, Dome, Union and Western Decalta, whose submissions tended to supplement the IPAC one, and Lewis Engineering whose submission was of restricted scope. Many of

the supporting members filed or presented responses.

Lewis Engineering is a consulting firm which operates for others on a contract basis. Its submission dealt only with the terminal transfer policy and its application to the present proration scheme and was made on behalf of certain companies, some of which themselves made submissions regarding the other aspects of the hearing.

Glossary

With the wide range of views advanced at the hearing there were necessarily many variations in usage and terminology appearing in the submissions. Consequently the following glossary is included to fix the meaning of some terms used throughout the report.

Minimum allowance - A basic allowance or a floor allowance. That part of a well's allowable which does not vary from month to month and which the well shall receive unaffected by variations in market demand as long as the aggregate of such minimum allowances does not exceed the provincial allowable.

Basic allowance - The minimum allowance of a well in a system whereby the aggregate of all minimum allowances is subtracted from the provincial allowable and the balance of the market demand is allocated and distributed according to other factors.

Floor allowance - The minimum allowance of a well in a system whereby all of the provincial allowable is allocated and distributed according to proration factors, subject to adjustment so that every qualified well may receive its minimum allowance.

Economic allowance - The basic allowance used in the present plan more or less reflecting the cost of operating a well, the cost of completing a well, the cost of drilling a well or a combination of them. The present plan provides for an "initial economic allowance" reflecting approximately all of the above costs to apply during the first seven years more or less of a pool's production and after that an "operating economic allowance" reflecting approximately the cost of completing a well and the cost of operating it.

Remaining reserves - The total reserves, recoverable by methods employed in the pool, remaining in the pool from time to time.

Provincial remaining reserves - The total of the remaining reserves of all oil pools subject to proration in the Province.

Ultimate reserves - The remaining reserves of a pool plus the volume of oil that has been produced from the pool.

Provincial ultimate reserves - The total of the ultimate reserves of all oil pools subject to proration in the Province.

Old pools - Pools already discovered at the date of the Board's decision given in this report.

New pools - Pools that will be discovered in the future.

Life index - The ratio of provincial remaining reserves to the corresponding annual producing rate.

Board - The full name of the Board before July 1, 1957, was "The Petroleum and Natural Gas Conservation Board" and after that date "Oil and Gas Conservation Board".

Pool allocation base - The determinant of the variable portion of the provincial allowable allocated to a pool.

Allocation factor - The ratio of the determinant of the variable portion of a pool's allocation to the sum of such determinants for the Province, i.e. the ratio of the pool allocation base to the sum of the allocation bases for all the pools in the Province.

MER or Maximum Efficient Rate - The maximum rate at which oil can be produced without avoidable underground waste.

MPR or Maximum Permissible Rate - The Board's estimate of the MER of the average well in a pool.

Pool MPR - The Board's estimate of the pool MER.

Primary non-unit area - A pool or part of a pool which is not included in any unit area or area in which a scheme for enhanced recovery, approved pursuant to section 38 of The Oil and Gas Conservation Act, is proceeding.

The phrases "40 acres", "80 acres", "160 acres", "320 acres" and "640 acres" are sometimes loosely used for "one legal subdivision", "two legal subdivisions", "quarter section", "half section" and "section" respectively.

II PROVISIONS OF STATUTE AND REGULATIONS

Section 36, subsection (1) of The Oil and Gas Conservation Act states:

36. (1) The Board may, by general or special orders, restrict the amount of oil or gas or both that may be produced in the Province

- (a) by fixing a provincial allowable for crude oil, condensate and pentanes plus not exceeding the market demand as determined by the Board,
- (b) by allocating the provincial allowable for crude oil, condensate and pentanes plus in a reasonable manner among the producing pools in the Province by fixing the amount of crude oil or condensate that may be produced from each pool, or of pentanes plus that may be produced from each plant, without waste to meet the provincial allowable so determined, and
- (c) by distributing the portion of the provincial allowable allocated to a pool in an equitable manner among the wells in the Pool, for the purpose of giving each well owner the opportunity of producing or receiving his just and equitable share of the oil in the pool.

It is under this provision that the monthly proration orders are made and it was anticipated in calling the hearing that this section would continue to be implemented.

Section 35 of the same Act authorizes the Board to control and regulate the production of oil, gas and water by restriction, proration or prohibition, but in view of the specific provisions regarding proration in section 36, the Board feels bound to follow the provisions of section 36 where a proration scheme is used.

Section 4 of the Act sets out the intent and purpose of the Act and this section would be available for the guidance of the Board to the extent that section 36 does not fully prescribe the criteria to be used by the Board. Section 4 reads as follows:

4. The intent and purpose of this Act are

- (a) to effect the conservation of the oil and gas resources of the Province,
- (b) to prevent the waste of the oil and gas resources of the Province,
- (c) to secure the observance of safe and efficient practices in the locating, spacing, drilling, equipping, completing, reworking, testing, operating and abandonment of wells and in all operations for the production of oil and gas, and

- (d) to afford to each owner the opportunity of obtaining his just and equitable share of the production of any pool.

Of particular interest for the purposes of this study is the intent of preventing the waste of the oil and gas reserves of the Province. Of interest too is the intent of affording each owner the opportunity of obtaining his just and equitable share of production of any pool. As is the case with most provisions of the Act, this latter provision has never been judicially interpreted in Alberta, but any question of its applicability in connection with prorating would appear to be answered by the reference in section 36, subsection (1), clause (c) to each well owner's opportunity of producing or receiving his just and equitable share.

For the proper appreciation and understanding of the reference to waste in section 4, it is necessary to refer to the definitions of "waste" and "wasteful operations" set out in section 2 of the Act.

They are as follows:

"waste", in addition to its ordinary meaning, means "waste" as that term is understood in the oil and gas industry, and includes the underground or surface loss through wasteful operations of oil or gas or of potentially recoverable oil or gas;

"wasteful operations" means

- (i) the locating, spacing, drilling, equipping,

completing, operating or producing of a well in a manner that results or tends to result in reducing the quantity of oil or gas ultimately recoverable from a pool under sound engineering and economic principles,

- (ii) the locating, drilling, equipping, completing, operating or producing of a well in a manner that causes or tends to cause excessive surface loss or destruction of oil or gas,
- (iii) the inefficient, excessive or improper use or dissipation of reservoir energy however caused,
- (iv) the failure to use suitable artificial, secondary or supplementary recovery methods in a pool where it appears probable on the basis of available information, that such methods would result in increasing the quantity of oil or gas ultimately recoverable from the pool under sound engineering and economic principles,
- (v) the escape or the flaring of gas, if it is estimated that, in the public interest and under sound engineering principles and in the light of economics and the risk factor involved, the gas could be gathered, processed if necessary, and it or the products therefrom marketed, stored for future marketing, or beneficially injected into an underground reservoir,

- (vi) the inefficient storing of oil or gas, whether on the surface or underground,
- (vii) the production of oil or gas in excess of proper storage facilities or of transportation and marketing facilities or of market demand therefor, or
- (viii) the use of gas for purposes other than pressuring, cycling, pressure maintenance or for light or as fuel, unless such use is beneficial, in the public interest and efficient.

It is noted that waste within the meaning of the Act is of a kind often referred to as "physical waste". It does not include "economic waste" although economic considerations enter into the determination of when physical losses become waste.

All of the submissions advocating certain prorating methods and received by the Board at the hearing were intended by those making them to be within the provisions of section 36, subsection (1). Although each person presenting a primary submission was asked if a change in the statute would be necessary or desirable in the event his submission was adopted, all answered in the negative.

In dealing with the question of distributing the portion of the provincial allowable allocated to a pool among wells in the pool, some of the submissions advocated varying the well's allowable in accordance with the area of the tract

upon which it was located and this will involve consideration of spacing unit provisions in the Act and regulations.

The Act defines 'spacing unit' as follows:

"spacing unit" means

- (i) the area allocated to a well for the purpose of drilling for or producing oil or gas,
- (ii) the area designated as one that will be allocated to a well if the well is drilled, or
- (iii) the subsurface regions vertically beneath such area allocated or designated,

and a spacing unit may be limited in application to a well drilling to or producing from or which may be drilled to a specified pool, geological formation, member or zone;

The Act empowers the Lieutenant Governor in Council to prescribe normal spacing units and to authorize the Board to prescribe other spacing units in a field, pool or area or special spacing units in an individual case. The spacing units established pursuant to these powers have proved useful in the administration of other provisions of the Act and regulations (e.g. section 22 of the Act which requires a person applying for a well licence to have the right to produce from the spacing unit of the proposed well), and it is reasonable to anticipate that they will continue to be useful. As by definition spacing unit means, among other things, the area allocated to a well for the purpose of producing oil, it would follow that to give effect to those

submissions that advocate varying allowables with the size of the wells' tracts it would be necessary to prescribe spacing units for producing oil of a different type than those used for other purposes. In short, a well might have two different spacing units for different purposes.

If it should be decided to have allowables varying with tract areas then the description of two different kinds of spacing units could, for the time being, be done within the present powers of the Lieutenant Governor in Council to prescribe, but the Board feels that if a plan with this feature should be adopted some amendment to the definition in the Act and to regulations might well be made to avoid confusing terminologies.

III NEED FOR AND OBJECTIVES OF PRORATION

Need for Proration

(1) Views of Industry

Most of those making submissions appeared to accept the concept of prorating, and under examination stated that they believed proration to be necessary. The direct testimony offered at the hearing regarding the need for proration was small and came from those who believed that it was to some extent superfluous either at present or in the future. Both Texaco Exploration and Texaco Canada stated that, following the terms of reference of the hearing, they believed that proration was considered a fait accompli by the Board and they did not think consideration was to be given to the need for prorating.

In general the participants indicated that prorating should foster broad conservation aims in the elimination of waste as defined in the Act, both as to physical loss of oil above and below ground, and waste in the economic sense. Most of those making submissions seemed to consider proration essential to protect the opportunity of producers under circumstances where supply exceeds demand and producing companies far outnumber purchasers. Pan American stated that it is essential for the orderly development of the producing industry. It stated that in a highly competitive market some fields would be unable to obtain pipe line connections, whereas others would be producing at a high rate. It

contended further that the sharing of markets is desirable, that operators should be given assurance of a market, and that without proration surface waste of oil would occur.

Hudson's Bay expressed the belief that proration is necessary from the point of view of both equity and conservation. It said further that where supply exceeds demand, without proration, purely exploration and producing companies would not have equal opportunity with integrated companies for exploration and development.

Socony Mobil, while agreeing that proration is necessary, stated that it is justifiable only as a means to effect conservation. It could not agree that proration as a means of protecting markets for individual producers is in any way defensible.

British American stated that although it believed the continuation of market sharing to be necessary, purchasers should have more choice in the type or quality of crude oil available. In its opinion this could be achieved by reclassifying pools into various categories of light crude oils and medium crude oil.

Imperial, while admitting a need for some form of market sharing due to the imbalance that has occurred between productive capacity and demand, contended that in future as productive capacity becomes balanced with demand proration among pools, as distinguished from within pool ratable withdrawal, will cease to be necessary. Sun held similar

views, but doubted the need even at present for among pool allocation.

(2) Views of the Board

The Board agrees with industry that, with the considerable excess of productive capacity in Alberta, proration among pools is necessary to assure that owners of producing wells in all pools with economically recoverable reserves are given the opportunity to produce.

The Board is of the opinion that proration within a pool is necessary in the interests of optimum recovery, and for the protection of owners' interests by giving each well owner the opportunity to produce his share of the oil in the pool.

The Board does not believe that reclassification of crude oil for proration purposes into further categories than those now used is necessary.

Objectives

1. Introduction

Most witnesses at the hearing indicated either directly or indirectly what they considered should be the overall objectives of any plan of proration. Through the general satisfaction they expressed with the proration provisions of The Oil and Gas Conservation Act each of those presenting primary submissions in effect indicated agreement with the basic statutory requirements which would have to be satisfied by any plan. Most witnesses also indicated

agreement with what might be termed general conservation objectives consistent with the overall intent of the Act. In addition, many who made submissions indicated other objectives less directly related to the provisions of the statute but which they believed important to the design of a sound proration plan.

The objectives of proration put forward were varied, but appeared to contain a body of principles which were supported to varying degrees by a large number of participants. The Board has reviewed all of these, which in many cases necessitated a significant degree of interpretation of the statements made in evidence, and has selected those which in its opinion either require satisfaction or warrant serious consideration.

For convenience the Board has classified the list of objectives according to those indicated by the proration provisions of the statute, those indicated by other provisions of The Oil and Gas Conservation Act and those others which the Board believes desirable generally but which are not indicated in the Act.

The relative importance given to objectives by the various participants in their submissions and at the hearing varied considerably. It is the Board's opinion that, other than giving precedence to the satisfaction of the provisions of the Act, further ranking would not be appropriate. As it was evident that in some cases objectives conflicted, it was

felt that each plan should be appraised according to the degree with which it satisfied firstly the statutory requirements and beyond that the objectives as a whole.

7. Objectives under the Proration Provisions of the Statute

The Board considers that the primary objectives of a plan must be those indicated by sections 4 and 36 of The Oil and Gas Conservation Act, namely

- (a) the allocation of the provincial allowable among producing pools in a reasonable manner and so that it may be produced without waste (section 36, subsection (1), clause (b)),
- (b) the distribution of each pool's allocation among wells in the pool in an equitable manner (section 36, subsection (1), clause (c)),
- (c) the prevention of waste of oil and gas resources and their conservation (section 4, clauses (b) and (a)), and
- (d) the giving to each owner the opportunity of obtaining his just and equitable share of the oil in the pool (section 4, clause (d) and section 36, subsection (1), clause (c)).

The majority of those making primary submissions indicated, either specifically or by implication, that satisfaction of the statutory provisions was an objective. Thus, it appeared to the Board that, as the proponents of submissions considered the Act adequate in its present form, this objective was assumed

by them to be basic.

3. Objectives Indicated by Other Provisions of the Statute

The Board is of the opinion that, as the aim of The Oil and Gas Conservation Act as reflected in its provisions generally is the prevention of waste and the conservation of the Province's oil and gas resources, then, as may be feasible and compatible with the proration provisions of the statute, a proration plan should be so designed as to encourage the effort of industry to maximize the recovery of oil from proved reserves. The Board, after consideration of the testimony finds that there are three basic objectives of this nature that should be considered separately rather than only as a consequence of primary objectives, pertaining to recovery stimulation, well abandonment and low reserve per acre pools. One or more of these objectives, discussed below, were put forward by both integrated and non-integrated companies as being of major importance relative to proration.

- (1) To encourage efforts to enhance the recovery from pools

The participants showed considerable concern over the need to provide incentives for increasing the ultimate recovery of oil from pools. In eight of the primary submissions this was considered to be of major importance. In most cases it was put forward as a principle of sound conservation and efficient practice, but further elaboration of its role as an objective of a proration plan was made particularly by

Great Plains, Imperial, Shell and IPAC. Great Plains submitted that enhanced recovery is a basic factor in sound conservation, and insofar as relevant, this should be recognized in the development of a proration plan by providing incentives to institute enhanced recovery schemes. Several participants expressed general concern over the indirect influence the present method of proration has on the design of enhanced recovery schemes, emphasizing that recovery may be sacrificed for the economic advantages arising out of the proration plan. Shell and IPAC in particular specified this point, submitting that a proration plan should be so designed that its influence on the design of enhanced recovery schemes or injection well patterns is minimized.

The Board agrees with industry that it is highly desirable that the proration plan adopted be one which would, in all circumstances, encourage maximum recovery of oil and gas.

- (2) To discourage the abandonment of wells before the production of all apparently economically recoverable oil

With few exceptions, premature abandonment of wells was considered undesirable from the standpoint of conservation, and it was contended that the proration plan should be designed so as to discourage premature abandonment. In general, it was argued that a proration plan should not prescribe an allowable for a well below that necessary to provide a level of revenue somewhat higher than that required to meet operating costs, if the well was capable of producing at an economic rate. There

were two basic approaches to the problem. On the one hand, the majority of submissions suggested special provision for the prevention of early abandonment of wells in both old and new pools, whereas three submissions, those of Texaco Exploration, Imperial and Pan American provided for wells in old pools only, suggesting that the problem of premature abandonment due to uneconomically low well allowables would not occur in new pools with a properly formulated plan. Imperial was particularly cautious about making special provision for the avoidance of premature abandonment, suggesting that allowances for such a contingency, though low, might detract from "the desirable incentives built into the proration formula and tend to delay the search for, and introduction of operating efficiencies". Imperial further contended that the problem of premature abandonment could be solved by means of operating procedures, such as flexibility of allowable transfers and intermittent production by accumulation of allowables.

The Board agrees with industry that the proration plan should provide allowables sufficiently high to prevent the abandonment of wells physically capable of an economic rate of production.

- (3) To assure production from low reserve per acre discoveries which appear economically recoverable

The industry, in general, expressed the belief that the opportunity of making a reasonable return on its exploration effort would be necessary for the continued well-being of the

oil industry. IPAC in particular and those companies supporting its submission pressed argument in this regard. It was IPAC's position that, as a large percentage of pools discovered have low reserves per acre, a proration plan which would discriminate against their development relative to high reserve per acre pools would not only reduce exploration activity, which in IPAC's view was the most important objective, but eventually would adversely affect both provincial and industry revenues. IPAC also said that in the long term, incentives for the development of low reserve discoveries would provide the lowest cost oil. It contended that, as a high proportion of discoveries are of this nature, a plan which would discourage their development would thus allocate all exploration costs to high reserve discoveries. In response to the primary submissions, Supertest, further to the IPAC position, suggested that the development of low reserve pools is a basic axiom of conservation, and that provision must be made for the possibility that the future oil potential of the Province may consist of such reserves.

California Standard took an opposite view. It contended that a plan which would promote the development of marginal pools would divert expenditures from exploratory effort. Furthermore, it argued that a plan should promote specifically the development of the higher reserve per acre pools in preference to those with low reserves per acre. With regard to the latter, it said that the provision of incentives for

the development of enhanced recovery projects would be more appropriate. Imperial opposed in general the provision of specific or direct incentives for the development of marginal pools. It submitted that a plan which would encourage operating efficiencies and recognize pool quality would provide more properly for the efficient development of such reserves. Imperial further suggested that a system of flexible well spacing, within limits, and with well allowables proportionate to acreage, would permit development of low reserve per acre pools. Such pools could then be developed on as wide spacing as productivity would permit, without allowable disadvantages vis-a-vis pools developed on closer spacing.

In order to assess the views expressed in the proper perspective the Board has made an analysis of the distribution of the total recoverable reserves of the Province as now known and the distribution of wells presently qualified for an allowable over the range of recoverable reserves per acre. This distribution is given in Figures 1 and 2 respectively. From Figure 1 it is apparent that only about 1 per cent of the reserves fall below the category of 500 barrels of recoverable reserves per acre. Correspondingly, Figure 2 indicates that less than 5 per cent of the qualifying wells are located in pools with reserves below 500 barrels per acre. In the Board's opinion this indicates that reserves below 500 barrels per acre are of little significance and that reserves in the range

of 500 to perhaps 2,000 barrels per acre are those which might be referred to as low reserve per acre pools. This category includes that part of the Pembina Field under primary recovery operations and about 50 very small pools of the some 280 pools in the Province, all of which together aggregate about 11 per cent of the reserves of the Province, and contain about 21 per cent of the total qualifying wells.

It is the Board's opinion, on the basis of its analysis, that the volume of reserves contained within low reserve per acre pools, and the number of wells affected are sufficiently large that production from such pools and the continued economic operation of the wells in them are necessary in the interest of conservation. The Board realizes that such production could have a slightly adverse effect on the overall cost of producing oil in the Province, but believes that such an effect should be considered secondary to conservation. The Board thus concludes that the share of production assigned to low reserve per acre pools must be sufficient to allow production from them.

4. Other Desirable Objectives

The objectives discussed under this heading represent those not directly indicated by the provisions of The Oil and Gas Conservation Act, but which industry and the Board feel should be satisfied as far as possible by a sound proration plan. In a number of submissions, objectives within this category were considered by their proponents to be of primary importance.

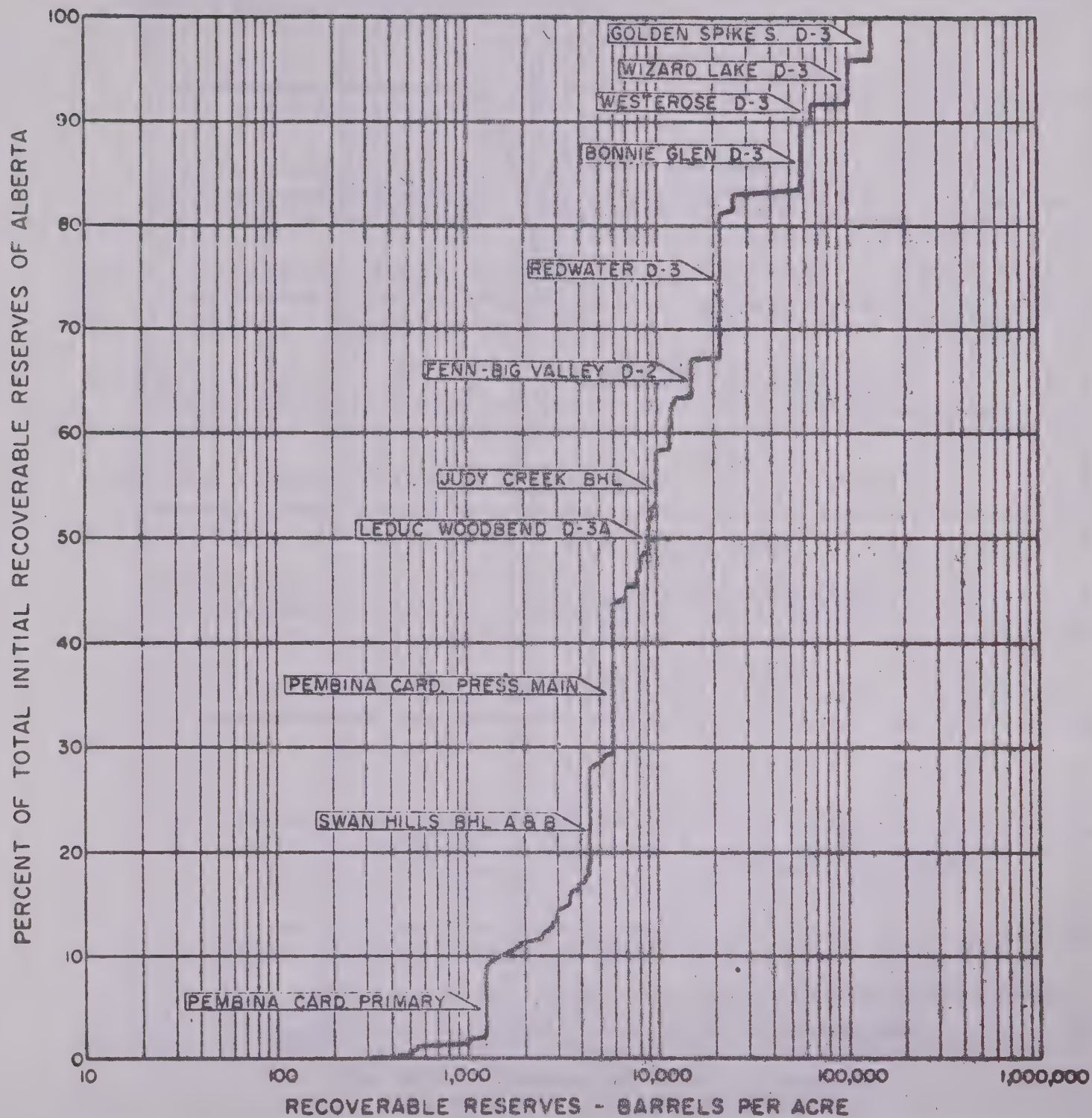


FIGURE 1 - DISTRIBUTION OF ALBERTA INITIAL RECOVERABLE RESERVES

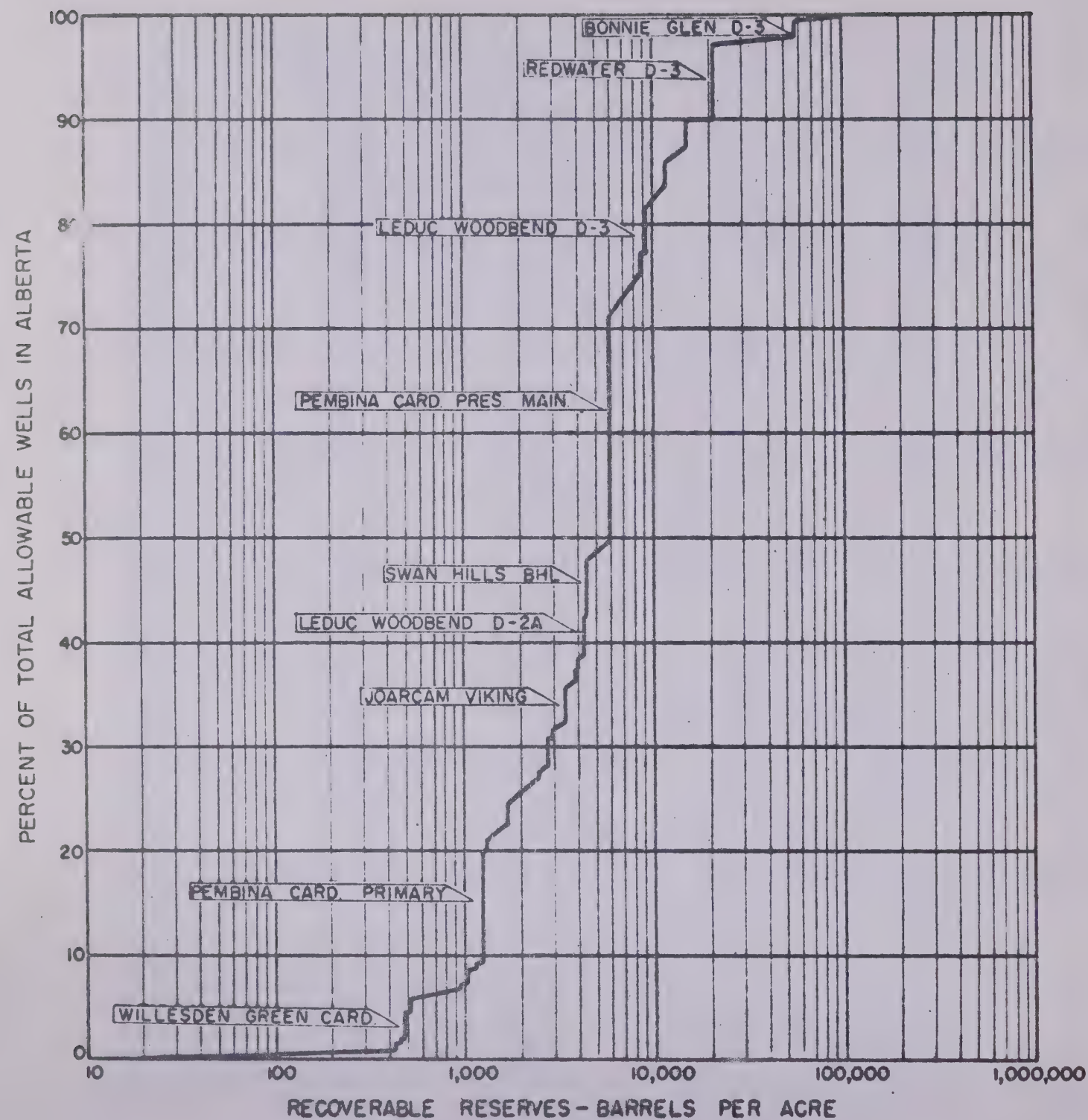


FIGURE 2 - DISTRIBUTION OF ALBERTA ALLOWABLE WELLS

The order in which these objectives are presented below has no significance.

- (1) To provide a system which is relatively simple to administer

Great Plains, Pan American, Socony Mobil and Shell in their primary submissions and Pacific in its response suggested that a proration plan should be relatively easy to administer. In all cases, it was implied that this should be a secondary consideration. Great Plains suggested, however, that with the availability of electronic computers, more detailed procedures than those presently used would not be administratively burdensome.

The Board believes that, as far as is practical, the administrative burden should be minimized, but does not believe that important principles should be sacrificed for the sake of simplicity.

- (2) To provide a method of allocation operable over a wide range of market conditions, both as to supply and demand, and allow continuity in the production from and development of pools

A number of those making submissions - Imperial, IPAC, Great Plains, Pan American, Shell and Supertest - stressed the need for a plan that would be operable over broad ranges of supply and demand, and would not necessitate frequent regulatory changes. Pan American and Shell were concerned about such stability in one particular respect, the influence on maintenance of reserves and productivity. IPAC and Supertest expressed

concern that abrupt changes in individual well allowables, other than those caused by demand changes, would redistribute revenues and could cause serious financial losses to those operators affected. Each, but IPAC in particular, emphasized its belief that the proration regulations should be fixed for a "reasonable period of time", and should not be subject to frequent changes, because of the impact on ability both to pay past loans and to facilitate future financing. Great Plains stated that changes should be made only when clearly beneficial to industry, as changes as frequent as those made to the present scheme would prevent producers from predicting revenues with any confidence.

Imperial presented this objective somewhat differently. It indicated that the problem of future stability is one of maintaining adequate reserves while balancing productivity with market demand. It appeared to believe that even though reserves may be maintained, to ignore ability to produce, while maintaining the present rigidity in spacing, would lead to imbalances between demand and productive capacity.

In its letter to the Canadian Petroleum Association and the Independent Petroleum Association of Canada, prior to calling the hearing, the Board invited submissions regarding a formula for market sharing which would be "workable over a broad range of market demand....". It is the Board's opinion, in agreement with industry, that it would be desirable if the basic allocation formula in a proration plan could remain

unchanged while accomodating wide fluctuations in demand, productive capacity, price and costs. On the other hand the Board recognizes that changes in the conditions under which the industry operates could necessitate review of the plan and that it may be desirable to make amendments following such reviews.

- (3) To encourage exploration and not deter any party interested from exploring for new reserves

Most making primary submissions considered the stimulation of exploration to be an important objective, and one, IPAC, considered this to be the prime objective. The general view of the industry appeared to be that, regardless of the present excess of provincial producing capacity, it is important that the Province maintain adequate reserves, the basic asset of the industry. Great Plains emphasized this idea, stating that the growth of the oil and gas industry is directly related to the results of exploration activity. Shell pointed out that considerable evidence of the need for increasing crude oil reserves in the future has been presented to the Board at three recent hearings.⁽¹⁾

Throughout the testimony, the impression was given that expenditures on exploration are to some extent an alternative

(1) Public hearings called to hear representations concerning the applications of Great Canadian Oil Sands Ltd., Cities Service Athabasca Inc., and Shell Canada Limited for schemes to produce synthetic crude oil from the Athabasca oil sands.

to development drilling. It was pointed out by Imperial that unnecessary development drilling would lead to low returns on investment, and thus would tend to discourage the flow of investment funds into the Province. The corollary would be that the future health of the Alberta oil industry would be dependent to an important extent on the level of exploratory activity, to be achieved in part by providing the incentives necessary to divert expenditures from excessive development drilling to exploration. Imperial contended further that the level of exploratory activity would depend on the returns to be expected from exploration. It suggested that a plan which would allow high profits from the better pools rather than moderate profits from all pools would give maximum encouragement to explore.

IPAC took a stronger stand in this regard than any of the other participants, submitting that, conservation criteria accepted, the major objective of a proration plan should be to stimulate exploration. Similarly, a plan should allow for the participation of a wide variety of operators. IPAC contended that it is through exploratory activity that revenues for both the Province and industry will develop, and that the greater the number of parties engaged in exploration, the more numerous and diverse will be the techniques developed, and the greater will be the volumes of oil found. In contrast to Imperial, IPAC expressed the belief that allowing all operators moderate profit levels rather than some high and

others low would provide the greatest encouragement to exploration.

Socony Mobil did not believe that a proration plan should incorporate specific incentives except those necessary for conservation. It said that a "reasonable" allocation, defined by it as one which would equalize the value of a barrel of reserves in all pools, would ensure continued exploration, as each operator would be assured of equal treatment in the allocation of production. Socony Mobil suggested further that the incorporation of preferential incentives in a proration plan directed towards exploratory activity would be beyond the powers of the Board under The Oil and Gas Conservation Act. Supertest supported this view, but also stated that a "reasonable" allocation would necessitate the guarantee of allowables sufficiently high to allow operators to produce at a profit.

The Board does not believe the stimulation of exploration to be a prime objective of prorating, but does believe it desirable both from the point of view of maintaining long term supplies and a healthy industry. It is the Board's opinion that, insofar as excessive development of known reserves is diverting expenditures from exploration, then as far as practical a future proration plan should operate to correct this trend. The Board believes, however, that this could well be accomplished through a plan which meets the major objectives, and that further, specific incentives are unnecessary.

- (4) To maintain the participation in the industry by anyone interested

Both Hudson's Bay and IPAC represented that a proration plan should be designed to give all operators equal opportunity to participate in the exploration for and development of oil reserves in the Province. Hudson's Bay said that to allow such wide participation a proration plan should not give special advantages to any type of reserve. Hudson's Bay indicated on cross-examination that only such diverse participation would generate the maximum possible reserves and technical advance. IPAC's position was essentially similar, except that it stated specifically that a prorating plan should encourage the continued participation of "independent" companies.

Hudson's Bay and IPAC both submitted that a plan which would favour development of high reserve per acre pools should be avoided. This would tend, they implied, to discriminate in favour of the large company. California Standard, conversely, although not denying the desirability of wide participation, submitted that any encouragement to explore or develop oil reserves should favour prolific pools in the interest of efficiency and low cost. Imperial proposed that any encouragement should be in favour of prolific pools, and the resulting profitability of producing operations would induce further investment.

The Board agrees with the general view of industry that

broad participation in the exploration for and production of crude oil is desirable, and that a proration plan should not incorporate special provisions of advantage to any particular group.

- (5) To encourage the economic optimum development within pools, and minimize the cost of oil

Almost all of those making primary submissions were concerned that a proration plan should encourage the optimum number of wells in the development of pools, and the corollary, minimization of capital and production costs. In general, it was felt that this should be made manifest in provisions designed to avoid overdevelopment and to encourage the maximum spacing patterns compatible with maximum recovery. California Standard and Imperial differed from others in stressing the need to develop high productivity pools rather than low, to minimize production costs. California Standard implied that any money spent in developing low reserve pools rather than high would increase the cost of oil. Imperial offered considerable evidence concerning the highly competitive market facing the oil industry, and contended that oil could not compete effectively with the present degree of regulation over supply. Imperial stated further that in the future proration will be unnecessary. Although it agreed that under present circumstances market sharing must be continued, Imperial stated that this is a cause of competitive weakness, aggravated by minimum production and pay out guarantees and

that competitive strength could be improved by discontinuing the guarantees to return development and operating costs. Imperial's view was supported by Sun. Socony Mobil submitted that the well concept as a factor in the calculation of allowables should be eliminated, thus avoiding incentives to drill except as productivity needs demanded. Shell, though in agreement with the principle of avoiding overdrilling, submitted that costs should be secondary to maintenance of supply.

The Board agrees that pools should be developed with a minimum of unnecessary wells, and that it is desirable that the costs of producing crude oil be kept to a minimum. The Board recognizes, however, that certain features of a plan necessary to promote the major objectives may not be wholly compatible with the minimization of costs.

IV HISTORY OF PRORATION IN ALBERTA AND THE PRESENT PRORATION PLAN

History

Proration of oil to market demand was introduced in Alberta in the Turner Valley Field. Gas production practices in this field had been grossly wasteful and in 1932 an order by the Department of Lands and Mines was issued to restrict production. Some four years later crude oil was discovered on the west flank of the field and due to intensive development, productive capacity soon exceeded demand. Initially the demand was distributed by purchasers' quotas, but in 1937 the Petroleum and Natural Gas Division of the Department assumed the responsibility and prorated on the basis of well potentials. The Petroleum and Natural Gas Conservation Board, formed in 1938, inherited this problem and subsequently adopted a new proration formula which gave consideration to well potential, gas-oil ratio, bottom hole pressure and acreage.

The outbreak of the Second World War led to a rapid growth in demand and proration was no longer necessary. The Board continued to prescribe allowables for the Turner Valley Field but for the prevention of waste and the protection of owner opportunity.

The second phase in the development of Alberta's oil industry began with the 1947 discovery at Leduc. In the following months crude oil producing capacity increased

rapidly and by 1949 exceeded market demand. Crude oil purchasers instituted a system of well acceptances which continued in effect until December, 1950. This procedure caused dissatisfaction, and during the summer of 1950, the Board was requested to accept the responsibility of prorating production to market demand as it was empowered to do under the Act. The Board called a hearing in October to hear representations regarding the need for restricting production to market demand and, if found necessary, the method by which such restriction should be carried out. In November, the Board announced its decision to prorate production starting December 1, 1950, and provided details of the plan adopted. Although there have been several amendments to the original plan the broad framework has continued to the present.

The plan followed the procedure set forth in the Act by providing for the fixing of a provincial allowable not exceeding the market demand, the allocation of this allowable among pools in the Province and the distribution of the pool allocation to wells in the pool. The provincial allowable, determined from purchasers' nominations considered at a monthly hearing, was subdivided into three categories of crude oil - light, medium and heavy.

Since the provincial allowable for heavy crude oil exceeded the productive capacity of the pools in this category, there was no need for proration.

The provincial allowable for the light and medium categories was allocated to pools in their respective categories by providing that each pool received

(a) an allocation equal to the sum of the economic allowances in the pool, and

(b) a share of the category's residual demand provided that the sum of (a) and (b) could not exceed the pool MPR as established by the Board.

The well economic allowance was designed "to reflect a reasonable allowance for the major economic factors involved in drilling and operating wells". The allowance varied with depth and ranged from a minimum of thirty barrels per day to fifty barrels per day at 8,000 feet. The pool's share of the residual demand was based on the pool MPR relative to the sum of the pool MPR's for all pools in the category.

The pool allocation was distributed to wells by dividing it by the number of wells in the pool.

Very early in the operation of the plan it became apparent that a minor modification was necessary in the computation of pool allocations and well allowables to allow for the application of penalty factors to well allowables to prevent excessive water or gas production and for the inability of some wells to produce the assigned allowable. The plan was amended by adopting two adjustment factors: the first factor was employed to reduce the pool potential to a level consistent with performance, and the second factor

was applied to increase the calculated well allowable where the pool potential had been reduced. The latter stage was necessary in order to obtain the appropriate allowable for a fully capable well.

The division of market demand into three crude oil categories was continued for several years. Discoveries increased the variety of crude oil produced in the Province and made the division between categories, particularly the light and medium categories, more difficult. In addition the expansion of crude oil pipe line gathering systems within the Province brought about the blending and commingling of production from different pools, thus making it difficult to consider such crude oils in different categories with different allocation factors. In 1955 the Board combined the light and medium categories.

In May, 1957, following representation from industry, the Board called a hearing to review the main principles of the proration plan and to consider the role and magnitude of the economic allowance. Most of the active companies in the industry participated in the hearing. The large majority of the submissions recommended no change in the basic principles but virtually all proposed modifications to the economic allowance. Most operators advocated amendment of the economic allowance schedule by slightly reducing values below 4,000 feet and by increasing values above 6,000 feet. Some proposed a lower schedule through the full range of depths.

Another proposal called for the replacement of the schedule by a floor allowance of thirty barrels per day which would be reduced over a period of four years to twenty barrels per day. A compromise proposal suggested an "investment economic allowance" during the early years of the pool's life and thereafter an operating allowance.

Industry opinion was divided on the question of the relative weight that the economic allowance should bear in the proration plan. Some proposed retention of the original system. Others recommended the adoption of a "residual MPR" plan whereby the residual demand would be allocated on the basis of the pool MPR less the pool economic allowance. Another submission proposed a floor allowance plan which meant that pool allocations would be in proportion to pool MPR's, provided that a pool allocation could not be less than the pool economic allowance.

In August, 1957, the Board announced certain amendments to the proration plan. The policy letter stated that the Board "believes that any economic allowance should afford a prudent operator the opportunity to meet his operating costs and to recover both his drilling and completion costs in a reasonable period of time. There seems, however, very little justification for the indefinite continuance of an economic allowance which would permit the several fold recovery of drilling costs". The Board adopted a two stage economic allowance system. The Initial Economic Allowance varied

from 30 barrels per day up to 3600 feet to 190 barrels per day at 15,000 feet. The Operating Economic Allowance varied from 25 barrels per day up to 4300 feet to 73 barrels per day at 15,000 feet. The initial allowance would be effective for seven years from the pool designation date and thereafter the operating allowance would apply. Conversion to the initial allowance schedule was January 1, 1958, but adoption of the operating schedule was deferred until January 1, 1962, or later depending on the pool designation date.

The Board advised industry that the Residual MPR plan had been adopted and would become effective January 1, 1960.

In the years immediately following the 1957 hearing there was a rapid increase in the initiation of "pattern flood" enhanced recovery schemes and in the conversion from "competitive" to unit operations. These developments had a substantial impact on the proration plan, particularly with regard to economic allowances.

In many instances enhanced recovery schemes involved the conversion of producing wells to injection wells, the establishment of observation wells and the abandonment of certain producing wells much earlier than would occur under primary depletion. It was inevitable that these developments would raise questions as to the basis for assigning an economic allowance to a well. From one point of view it was not rational to grant such an allowance to any well but a

producing well. From a different point of view the injection or observation well was just as necessary to the scheme as a producing well - under primary depletion it would have been a producing well and therefore would have received an economic allowance and consequently, the argument ran, the scheme should be credited with the allowance.

Allowables for unit operations presented similar problems with regard to the transfer of economic allowances. Should units receive economic allowances for wells which were shut in? It was debatable whether the unit allowable should be based upon a full economic allowance for every producible well, or upon the demonstrated productivity of each well.

These matters were considered at a public hearing held in June, 1961. In September the Board announced that the economic allowance allocation of a unit or project would be determined as follows:

- (a) for production wells, the lesser of the subsisting economic allowance or current physical productivity, and
- (b) for injection and observation wells, the subsisting economic allowance if the well is necessary to the scheme, would have been capable of commercial production and would have qualified for an oil allowable, and subject to the Terminal Transfer Policy.

The Terminal Transfer Policy provides for the transfer of the economic allowance of the injection well under certain circumstances and for a limited period. Transfer is permitted only for those schemes that are implemented above or near the saturation pressure of the pool and the transfer period is calculated to ensure that there would be "little or no reduction in current rates of production from that anticipated by natural depletion".

A similar issue regarding the economic allowance arose with regard to multi-zone completions. It had been Board practice to grant a full economic allowance for each zone in which a well was completed and separately produced. This practice did not seem to be in keeping with the general principle outlined in the Board letter following the 1957 hearing and the Board decided to call a hearing in April, 1960, to reconsider this matter. Following the hearing the Board announced that a multi-zone well would be assigned the economic allowance for the zone having the highest MPR and for each other zone the well would be assigned a lesser allowable prescribed according to certain rules.

Another minor amendment to the overall proration plan was made in 1959 following the suggestion made by the Board to industry that the two adjustment factors employed in the proration calculation be replaced by one demand adjustment factor. The existing factors had applied on a pool basis to the pool potential and to the average well allowable,

whereas the demand adjustment factor related only to the total provincial allowable for light and medium crude oil.

Details of the Present Plan

Each month the Board calls a hearing to review purchasers' nominations for Alberta oil for the following month. Requirements are classified into three categories - pentanes plus, light and medium crude oil and heavy crude oil. The Board does not prorate pentanes plus production or heavy crude oil production to market demand. The Board's estimate of pentanes plus production and the purchasers' nominations for heavy crude oil are subtracted from the total oil requirements to determine the provincial allowable for light and medium crude oil.

A summary of the current procedure for prorating light and medium crude oil production is as follows:

1. The provincial allowable is determined in the manner outlined above.

2. The provincial allowable is allocated among pools in the Province by the following procedure:

- (1) The pool economic allowance is determined by summing the economic allowances of wells in the pool that are entitled to the allowance. The provincial economic allowance is determined by summing the pool economic allowances.

- (2) The pool producing potential is equal to the pool MPR as set by the Board or where this has not been established by multiplying the number of wells by the well MPR. The provincial producing potential is obtained by summing the pool potentials.
- (3) The demand adjustment factor consistent with the level of demand for the particular month is estimated and applied to determine the adjusted demand.
- (4) The allocation factor is calculated by dividing the adjusted demand less the provincial economic allowance by the provincial producing potential less the provincial economic allowance.
- (5) The pool share of the residual demand is calculated by multiplying the residual pool MPR (i.e. pool MPR less pool economic allowance) by the allocation factor.
- (6) The pool allocation is the sum of the pool economic allowance and the pool share of the residual demand.

3. The pool allocation is distributed to wells in the pool by dividing the pool allocation by the number of qualifying wells in the pool.

Where a unit or project allowable is in effect the allowable is established as though the unit or project were a separate pool having the average properties of the pool containing it.

The well and pool allowables calculated in the above manner are set out in an order which is distributed each month to all operators in the Province. The order includes other details such as the applicable penalty schedules and special allowables for certain wells. Where an enhanced recovery scheme has not satisfied the criteria to receive a project allowable and is not operated as a unit the Board provides for the transfer of allowables in the scheme by a supplementary order. In this order injection and observation well allowables are distributed to adjacent producing wells. Production from lease line wells in projects and units is limited by order.

Deficiencies of the Present Plan

Most of the submissions presented at the November, 1963, proration hearing pointed out deficiencies in the present proration plan. The most serious of these, as seen by industry, are summarized below.

1. Encouragement of the Drilling of Unnecessary Development Wells

The contention that the present plan provides encouragement to drill unnecessary development wells was a theme that ran through most of the submissions. Imperial and others

noted that the effect of this undesirable feature had been reduced when the standard one and two legal subdivision spacing units were changed to one quarter section spacing.

The Board agrees with the contention that under the present plan there is a tendency for excess wells to be drilled. The move to wider spacing in recent years has helped but the Board notes that the substantial gap that developed after 1957 between productive capacity and demand has none the less continued. The Board believes that this excessive productivity has resulted largely from the high minimum well allowances and the effect of the life factor in determining MPR's.

2. Insufficient Incentive for Maximum Recovery by Enhanced Recovery Schemes

Great Plains and IPAC contended that the present plan encourages the design of pressure maintenance schemes that will minimize the loss of economic allowances rather than provide maximum recovery. Imperial argued that because of the present plan there is little incentive to maximize secondary and tertiary recoveries, that implementation of schemes has been delayed and that the schemes when proposed were not necessarily best for maximum recovery. Imperial advised that examples of delay in implementation are to be found in the Joarcam, Leduc D2 and McLeod pools. It contended that this would cause recovery losses in the order of five to ten per cent.

The Board recognizes that the low level of the ratio of market demand to productive capacity in recent years and the tendency for overdevelopment of pools under the present plan has resulted in only a small portion of the total demand for crude oil being allocated to pools and wells on a basis related to recovery efficiency. There can be little doubt that this has had an effect on the design and time of implementation of enhanced recovery schemes. The Board now believes that improved overall conservation can be achieved by increasing the role of recovery efficiency in the proration plan.

3. Insufficient Incentive to Explore for New Oil Reserves

Many of the submissions either directly or by implication suggested that the present proration plan does not provide the proper incentive for exploration. There was a wide divergence of opinion regarding the cause of the deficiency and the means of correcting it.

Imperial, and others, argued that the present economic allowances make primary exploration less attractive than semi-development or step-out type exploration, thereby reducing the possibility of major discoveries. They contended that the solution to the problem lay in eliminating or minimizing well allowances and in prorating on reserves only.

IPAC, and others, proposed greater encouragement for exploration, thereby implying that the current system is not ideal. According to this group, exploration success is dependent upon the number of participating companies and the

total effort. To encourage more exploration they proposed wider spacing to reduce investment in development wells and higher minimum well allowances to ensure that any discovery could be successfully developed.

It is difficult for the Board to evaluate these conflicting views. If considered from the outlook of an individual company both probably have some validity. If considered from the view of the whole industry they are probably much less significant. During the last ten years there have been substantial changes in allowables, in the ratio of production to productive capacity, and in the life index, but nonetheless there has been a gradual increasing trend in the number of exploratory wells drilled with relatively small fluctuations from year to year. The Board concludes that the real incentive for exploration is the expectation of making a discovery. Nevertheless it does recognize that the proration plan may influence the type of exploration and the number of operators participating in it.

4. Administrative Complexity

Imperial and Pan American referred to administrative complexities, particularly to the growing number of special rules for enhanced recovery schemes. Pan American suggested these complexities are a burden to industry and the Board.

The Board agrees that with recent developments, administration of the proration plan has become complex. The

implementation of pattern flood enhanced recovery schemes and the conversion from competitive to unit operations have placed a strain on the principle of economic allowances. They have caused controversy regarding the rules for granting economic allowances and have resulted in the adoption of rather arbitrary rules that are difficult to administer, provide the possibility of abuse and contribute little to conservation or efficient production practices.

5. Increased Operating Costs

There were many references during the hearing to the unfavourable effect the proration plan has had on production costs. The IPAC submission referred not only to economic waste arising from overdevelopment, but also from well testing necessitated by the plan and the requirement under competitive operations of producing all wells.

The Board agrees that certain features of the present plan have resulted in increased operating costs. It believes that the new plan as set out in Section X will substantially reduce this deficiency.

V SCOPE OF PRORATING

The notice of hearing, as mentioned earlier, invited representations respecting the allocation of that portion of the provincial allowable for oil not supplied by synthetic crude oil from oil sands and specifically the allocation to pools and wells of those portions of the provincial allowable to be supplied by

- (a) condensate or pentanes plus recovered as the result of the production and processing of gas for market or the cycling of gas-condensate pools,
- (b) black or heavy crude oil,
- (c) light and medium crude oil from pools not now subject to prorating, and
- (d) light and medium crude oil from pools now subject to prorating.

In Alberta at the present time crude oil production within light and medium classifications is prorated to market demand except for the minor amounts of production from pools discovered prior to 1947 and from small accumulations located in gas fields or in undesignated pools. Condensate and pentanes plus and heavy crude oil production are not prorated.

In this section of the report the circumstances and the considerations respecting the scope of proration, as enunciated by industry at the hearing and as viewed by the Board, will be discussed under the headings of the four principal categories of crude oil and natural gas liquid production.

Condensate and Pentanes Plus

Prior to the completion of major gas pipe lines to markets outside the Province, production of condensate and pentanes plus was confined to the by-products of plants which were processing raw gas for local use and represented less than one per cent of the crude oil market. However, with the advent of extraprovincial gas marketing on a large scale basis, numerous plants were built to process the gas for the removal of natural gas liquids so that the gas would meet purchasers' specifications. In addition cycling plants to process natural gas containing large percentages of natural gas liquids were built to permit the conservation and marketing of these liquids. The dry gas which remains after removal of the liquids in cycling plants is returned to the reservoir and in some cases is supplemented with dry gas from other fields to achieve pressure maintenance and thus increase the percentage recovery of the natural gas liquids in the reservoir. When cycling becomes uneconomic, the dry gas production is marketed rather than injected and the cycling plant is then operated as a conventional gas processing plant.

During 1963, production of condensate and pentanes plus from plants processing gas for market supplied 7.3 per cent of the light and medium crude oil market. Cycling plant production supplied a further 3.8 per cent. Condensate and pentanes plus whether originating from cycling plants or

plants processing gas for market have continued to be excluded from proration in Alberta.

At the hearing Dome, Sun, Texaco Exploration, Union and Western Decalta favoured proration of condensate and pentanes plus from cycling plants. Texaco Exploration's representations were confined to possible future cycling schemes. Generally these companies submitted that the producing life of a cycling project should be equivalent to that of a pool producing prorated crude oil since the products are competing for the same market. Dome, the principal advocate of the proration of condensate and pentanes plus from cycling plants, submitted that cycling schemes should be allocated an economic allowance on the basis of the area included in the scheme and should share in the residual demand in the same manner as crude oil pools. Dome further suggested that there is little difference between a pressure maintenance scheme intended to increase oil recovery by gas injection and a cycling scheme to improve recovery of condensate and pentanes plus. According to Dome these hydrocarbons from cycling plants are interchangeable with crude oil in much of the market and the production has been increasing rapidly in recent years. It was concerned that, without proration of these products in a manner similar to light and medium crude oil, the cycling plant production could be more profitable than prorated crude oil, and that this might lead to the rapid growth of cycling

plant production and a further reduction in the percentage of the oil market supplied by light and medium crude oil.

With the exception of the companies mentioned above, those making submissions opposed proration of condensate and pentanes plus from cycling plants on the grounds that cycling was necessary for conservation, that it was usually necessary to defer the building of a cycling plant until a pool was fully delineated to permit proper plant sizing and location of injection wells, that delays were involved in applying for and obtaining Board approval, that the gas reserves could not be marketed until completion of the cycling phase and that cycling plant production still supplied only a small part of the market. They felt that having regard to these considerations it would be inappropriate to impose further restrictions to detract from the profitability of cycling projects. It was further argued that it would be inconsistent to prorate cycling plant production while permitting the hydrocarbon liquid production of other gas plants to remain unprorated. The amount of hydrocarbon liquid production of such other gas processing plants is closely related to the volume of gas processed. As a consequence, if condensate and pentanes plus produced from such plants were prorated, a portion of the hydrocarbon liquid production would have to be returned to the reservoir or directed to other storage facilities. This could lead to reduction in the ultimate hydrocarbon liquid recovery due

to storage losses and hence would not be in keeping with conservation objectives.

The Board believes that, during the next ten years or so, production of condensate and pentanes plus from plants processing gas for market is not likely to exceed 10 per cent or so of the average crude oil market and that, in the same period, cycling plants are not likely to supply more than a further 5 per cent or so of the market. In addition, in some cases, if the natural gas liquids produced from gas processing plants are not marketed, a portion may be lost. The Board therefore believes that condensate and pentanes plus production from gas processing plants and cycling plants should remain unprorated having regard both to conservation considerations and to the modest impact of this production on the market for light and medium crude oil. Nevertheless it feels that future cycling plants should be sized having regard not only to conservation considerations but also to the impact of their production on the crude oil market.

Should the proportion of the market occupied by condensate and pentanes plus production increase more rapidly than expected the Board might reconsider this decision as it applies to production from cycling plants.

Black or Heavy Crude Oil

The production of wells producing heavy crude oil has always been unprorated although the wells are subject to average daily allowables corresponding to the greater of the

MPR or the subsisting economic allowance.

Every organization making a submission favoured continued exemption of heavy crude oil from proration, although IPAC and one or two others qualified their recommendation to apply only to the present situation in which heavy crude oil production is in reasonable balance with demand, and absorbs a relatively small part of the total market.

The Board agrees with industry that black or heavy crude oil now supplies a market that is separate from and only partially interchangeable with that for light and medium crude oil. It believes that if development of large reserves of heavy crude oil should occur, and especially if plants are built to upgrade such oil, it may be necessary in the future to include this category of production in a proration plan. However, the Board does not consider its inclusion at this time to be necessary or desirable.

Light and Medium Crude Oil from Pools not now
Subject to Proration

The production from those pools discovered prior to the development of the Leduc-Woodbend Field and producing light and medium crude oil, in the order of about 3,500 barrels per day, generally has been less than the allowables which would have been established for them under the 1950 plan and modifications of it. The exclusion of these pools from proration therefore has had no significant effect on the provincial allowable to be shared by the remaining pools.

Minor oil accumulations in gas producing areas and accumulations outside designated pools have been exempt from proration for many years. Production from them has averaged about 4,500 barrels per day. Wells in such pools currently are granted allowables equal to the greatest of the well MPR, the initial economic allowance or 50 barrels per day, until their inclusion in the pools subject to proration is warranted on the basis of the rules followed by the Board. These rules provide for inclusion of wells in the proration plan when certain conditions are satisfied.

Except for Texaco Exploration and Great Plains there was general agreement among those making submissions that pools producing light or medium crude oil which are not now subject to proration should remain unprorated.

Texaco Exploration opposed in principle the exemption of certain pools producing light and medium crude oil from the proration plan. However, it stated that exemptions may be necessary where pools straddle provincial boundaries and where other special circumstances exist. It further stated that applications for exemption should be decided after a public hearing. Also, Great Plains submitted that, except for a somewhat higher minimum allowable, the production of wells outside defined pools producing light or medium crude oil should be prorated in the same manner as that of wells in defined pools.

The Board concludes, on the basis of the evidence

presented at the hearing, that most of industry concurs with the Board's current policy respecting the permissible rates of production of pools discovered prior to the development of the Leduc-Woodbend Field and of minor oil accumulations in gas producing areas and accumulations outside designated fields. The Board does not believe that any of the changes to the proration plan proposed at the hearing, if adopted, would warrant making the production of these pools subject to proration at this time. However, the Board believes that, with the changes to be made respecting the level of minimum allowances and the method of proration, modifications to the rules respecting the allowables of wells outside designated fields will be necessary. It further believes that it may be desirable, in the interest of conservation, to exclude from proration crude oil production from pools subject to concurrent gas cap and oil zone depletion and from certain other oil pools which are in advanced stages of depletion.

Light and Medium Crude Oil from Pools now Subject to Proration

As discussed in more detail in Section III, the organizations making submissions at the hearing, in commenting on the need for proration, generally agreed that proration of light and medium crude oil production is necessary in the

present circumstances. Imperial submitted that proration would become unnecessary when the demand approached the productive capacity. Only Sun submitted that, while proration within pools is necessary, proration among pools could be dispensed with even in current circumstances.

The Board believes that, as long as there is a substantial excess in the productive capacity of light and medium crude oil, in the interests of conservation and to maintain equality of opportunity among owners, it is necessary that proration of light and medium crude oil production to balance market demand be continued.

VI MINIMUM ALLOWANCES

The Principle of a Minimum Allowance

(1) Views of Industry

In the submissions made to the Board there was virtually unanimous agreement that some kind of a minimum allowance was needed. The reasons cited were varied, as were the magnitude and circumstances of application of the minimum allowances that were advocated.

In the submissions of Pan American, Texaco Exploration and Imperial, and in the response of Triad, a minimum allowance was proposed only for wells in old pools, and was thought necessary by them to ensure that such wells, drilled under the present proration plan, would not be prematurely abandoned because of the reduced allowables which the wells could be allocated under the proration plans recommended. British American, California Standard, Hudson's Bay, Shell, Socony Mobil and Texaco Canada all referred in their submissions to the general problem of premature abandonment of wells and to meet it each recommended that a minimum allowance be provided for wells in both old and new pools.

Supertest stated in its response that there is a need for a minimum allowance to permit the production of oil reserves which, in the absence of proration, could be produced at profitable rates. Supertest argued that a

proration plan which failed to do this would be "anti-conservation" and would lead to "highgrading" of the Province's resources. In the same vein Great Plains supported a minimum allowance as necessary to ensure that low reserve per acre pools which are found will be developed. IPAC went further and in its response to the submissions of others stated that the criteria for a minimum allowance are not those usually cited - of guarding against premature abandonment, of preventing unreasonably low allocations to a well because of declining remaining reserves, or of encouraging operators to test or complete marginal wells. Rather, IPAC contended, the real purpose of a minimum allowance (at the level which it advocated) is to maintain a stable incentive for continued exploration for both low and high reserve per acre pools. Socony Mobil supported the use of a minimum allowance in order that all low reserve per acre pools found could be produced if their productivity warranted it.

In argument Supertest contended that "an opportunity to produce his just and equitable share" is a realistic opportunity only if there is a minimum allowance below which the allowable would not be reduced regardless of variations in supply and demand. In the same vein, Great Plains in its response stated that proration on the basis of reserves only does not recognize the right of an owner to produce a well at an economic rate.

Hudson's Bay and Texaco Canada argued that in a remaining reserves proration plan which they advocated a minimum allowance is a practical and necessary factor to prevent an inordinate prolongation by the plan of the producing life of a pool. The need for a minimum allowance under such circumstance was accepted by most proponents of an ultimate reserve plan but it was held by them to be a deficiency of a remaining reserves system.

In opposing a minimum allowance for wells drilled in new pools, Imperial and Pan American argued that it would provide a guaranteed income and hence shelter the well owner from the full impact of market fluctuations - in other words, any minimum allowance is contrary to the principles of a competitive enterprise system. Further, the income for a well guaranteed by a minimum allowance would provide an incentive to drill more wells than are necessary for efficient exploitation of a pool, with the result that less capital would be available to explore for new reserves or to install enhanced recovery schemes. Also, it was argued that a minimum allowance for new pools will be unnecessary as long as there is sufficient flexibility in the application of other proration factors to permit the owner of a well to obtain an economically attractive allowable by adjusting well spacing, and hence the reserves, attributable to a well.

(2) Views of the Board

The Board accepts the concept of a minimum allowance as a proper one. It believes the minimum allowance to be necessary in both old and new pools to avoid premature abandonment of wells and to permit the completion and operation of wells drilled to low reserve per acre pools. The Board does not accept the view of IPAC that the prime purpose of a minimum allowance is to pay out drilling costs and thus provide an incentive for exploration.

Basic or Floor Allowance

A minimum allowance may be provided in a proration plan as either a basic allowance or a floor allowance. If it is a basic allowance the fraction of the total demand necessary to satisfy this minimum allowance of all qualified wells is first allocated and the remaining demand is then allocated in accordance with other factors of the plan such as reserves or MPR's. If the minimum is a floor allowance the total demand is first allocated on the basis of the other factors, then an adjustment is made so that each well allocated an amount less than the floor allowance in the first instance is allocated an amount equal to the floor allowance, the allowables of other wells then being reduced accordingly. Except for this adjustment, allowables resulting from a floor system vary proportionately among all types of pools with each variation in the ratio of demand to supply. For wells receiving low allowables, the

basic allowance system is fundamentally less sensitive than the floor system to fluctuations in demand or supply as long as the total demand is greater than the sum of the minimum allowances. The converse is true for high allowable wells.

(1) Views of Industry

While each submission made to the Board on the subject of prorating referred to minimum allowances, and to whether the minimum allowance should be a basic or a floor allowance, there was quite limited evidence adduced that one was inherently superior to the other. The supporters of the floor system, including Pan American, Texaco Exploration, Hudson's Bay, Imperial, Socony Mobil, British American and others, were those companies who sought allowables for wells in proportion to reserves or a modification of reserves and who sought a correction to the feature of the present (basic) plan wherein the allowables of wells do not vary directly with changes in the ratio of demand and productive capacity. Those endorsing the basic system, including IPAC, Great Plains and Shell, appeared to be more concerned that each capable well should be assured what they considered to be an economic producing rate regardless of reserves, than with the question of whether or not their objectives could be realized equally well with a floor or with a basic system.

Imperial in its response presented figures to show that whether the minimum allowance is used as a basic or a floor allowance makes a significant difference in the fraction of

the total demand which is "consumed by recovery-insensitive schedules". Imperial, in advocating maximum exposure of allowables to market fluctuations, concluded that a basic system reduces the exposure from that obtained with a floor system and consequently is less desirable. Its contention seemed to be that if a floor allowance will meet the desired objectives of a minimum allowance, then why go the further step of using the minimum as a basic allowance. Socony Mobil stated that basic allowances would absorb too large a share of the proratable market and result in reduced incentives for increasing reserves.

Taking the contrary view, Great Plains contended that the well is of prime importance and so should be provided a basic allowance in the first instance, with the then remaining market being shared on the basis of reserves.

(2) Views of the Board

Having accepted that the fundamental justifications for a minimum allowance are to avoid premature abandonment and to permit the completion and production of wells drilled to marginal reserves, and that a suitable minimum is to be provided, it seems to the Board that the floor allowance meets the requirements. There appears to the Board to be little basis for the provision of an increment above the required minimum as would result with a basic allowance. Notwithstanding that the present system incorporates a basic allowance, the Board is now of the opinion that the

floor concept, which adequately serves the justifiable objectives of a minimum allowance while leaving a greater portion of the provincial allowable for allocation on reserves or a related factor, is a preferable one. Also, the Board prefers the floor allowance system since with it any fluctuations in demand are reflected almost equally on a percentage basis in all allowables above the floor level.

Magnitude and Depth or Acreage Dependence

In making representations on the subject of minimum allowances the chief concern of most witnesses was the size of the allowance, and whether or not it should vary with depth or with the acreage attributed to the well.

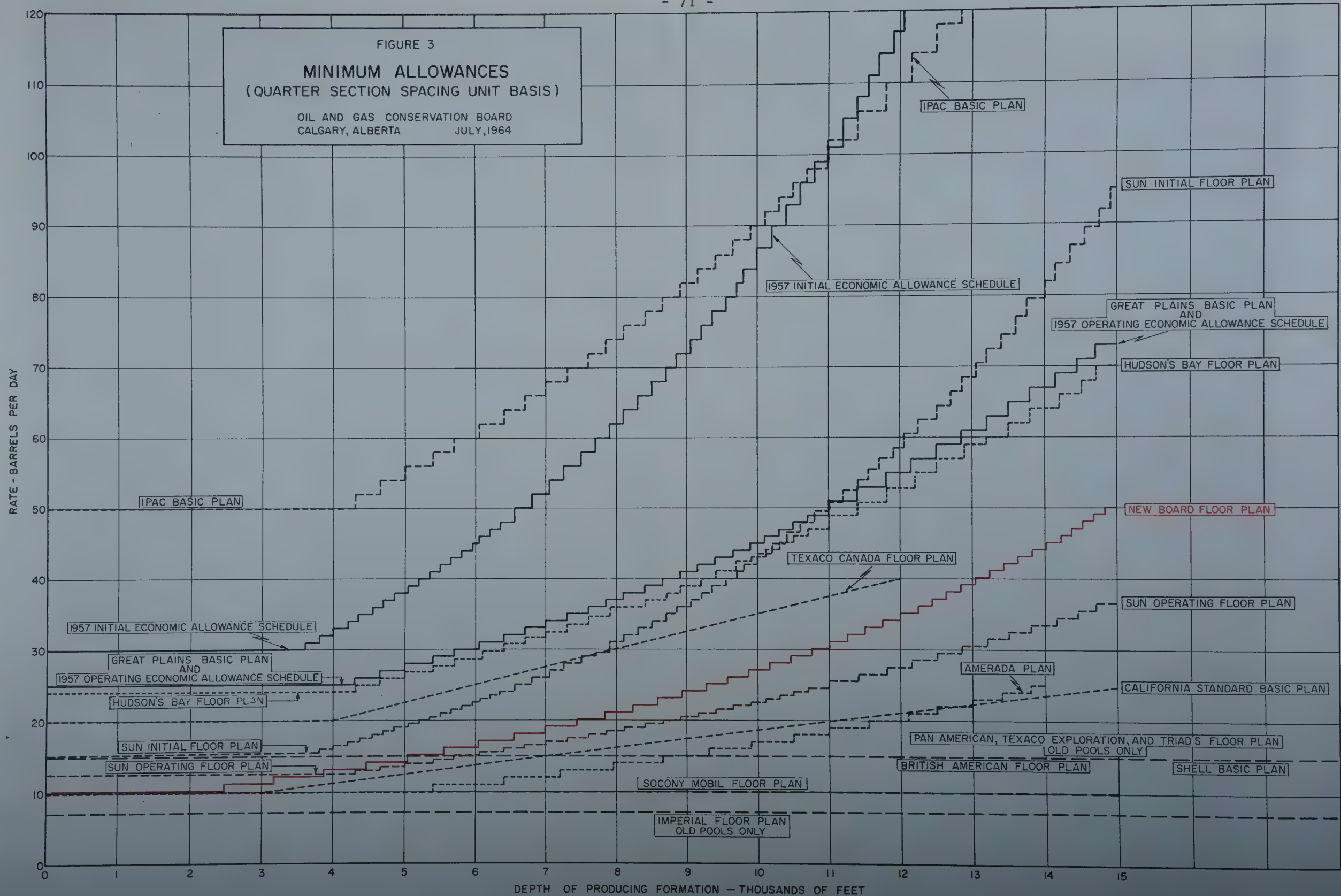
1. Magnitude and Depth Dependence

(1) Views of Industry

The range of suggested allowances was very wide. Figure 3 is a graphical presentation of the rates proposed in the primary submissions, based on a well on a quarter section spacing unit. The figure shows the proposed levels of the minimum allowance plotted against depth of the producing formation. It also includes for comparison the values for the initial and operating economic allowances used as a basic allowance in the present proration plan. These are referred to in the figure as 1957 initial economic allowance schedule and 1957 operating economic allowance schedule.

Six of the twelve proposals were for allowances related to depth. The basic allowance of IPAC was the highest of those proposed and while similar to the present initial economic allowance, was 20 barrels per day higher than the present allowance for shallow pools, becoming equal to it at about 11,000 feet, and less than it at greater depths. The Sun initial floor allowance, the Great Plains basic allowance, and the Hudson's Bay acreage floor allowance all closely approximated one another and the present operating economic allowance schedule, with some variation at shallow and great depths. At the lower range of the depth-related proposals were those of Texaco Canada, California Standard and the Sun operating floor allowance.

The remaining six proposals were all for a fixed allowance regardless of depth. Three of these six, those proposed by Pan American, Imperial and Texaco Exploration, were floor allowances for wells drilled in old pools, with no minimum allowance for wells in new pools. Socony Mobil proposed a constant floor allowance of 10 barrels per day per well, and British American one of 15 barrels per day per well, for wells in both old and new pools. The Shell proposal was for 15 barrels per day per well at all depths, and was unique in that it was the only minimum allowance not depth dependent which was proposed for use as a basic allowance. Under Shell's proposal a depth factor was introduced to modify the main component of the allowable. This is



discussed more fully in a later section.

In addition to the minimum allowances advocated in primary submissions, there were two other proposals made in responses. Amerada proposed a minimum allowance of 10 barrels per day for wells in pools at depths to 5,000 feet, increasing exponentially thereafter to 25 barrels per day at 14,000 feet. Triad took the position that the proposals of Pan American and Texaco Exploration, a flat 15 barrels per day per well in old pools only, with no minimum for wells in new pools, should be the maximum value to be considered.

In general the proponents of the lower range of minimum allowances argued that the allowance should permit the production of a well at economic rates, but should not be so attractive as to create an incentive to drill a well. There was some variation in the estimate of the allowable rate which would be required to achieve this goal, with some claiming they would be prepared to drill a well for the allowable advanced by another company as one which would not be large enough to encourage the drilling of unnecessary wells. Many of those making submissions felt that the relatively high minimum allowances of the present plan had resulted in either some or a great deal of overdrilling, although a few argued that the overdrilling had been reduced in recent years by the trend to wider spacing. IPAC and others contended that overdrilling was caused by

lack of direct incentives for wide spacing, rather than by the magnitude of the minimum allowance. All concurred that a revised plan should be adopted to minimize overdrilling in the future.

Some of those who supported the larger minimum allowances, including IPAC and Supertest, contended that these were necessary as an incentive either to explore for or develop new pools, and that overdrilling should be controlled by the Board through a stringent policy directed to wide well spacing and an incentive in the minimum allowable for wider spacing. IPAC in particular pointed out that on an historical basis the incidence of high reserve per acre pools is much lower than that of low reserve per acre pools. It argued that unless the minimum allowance provided assurance that the low reserves per acre pools could be economically developed and produced the exploratory success ratio of economic discoveries would be adversely affected. The result would be that exploration activity would become financially unattractive and many companies would shift their activities to areas outside Alberta.

Relative to the use of a depth modifier for the minimum allowance, those who favoured an increase in minimum allowance with depth contended that the cost of drilling, of completing and of operating a well increased with depth, and if the minimum allowance was to provide a pay-out or be related to any or all of these factors, then it must necessarily be scaled with depth. Those who en-

dorsed a flat rate were also the advocates of the lower range of rates proposed. They argued that the main purpose of the minimum allowance was to avoid abandonment of a well while it was still capable of economic production. They stated that minimum allowances of the levels they proposed would be adequate for this purpose regardless of well depth.

(2) Views of the Board

Having regard for the purpose of the minimum allowance the Board believes that it should be large enough, but no larger, than necessary to prevent premature abandonment and reasonably to permit production from and prevent the waste of all significant reserves discovered and the continued production of all wells physically capable of production at economic rates.

In the light of the overall objectives of a proration plan, the present evidence relating to the undesirable effects of a high minimum allowance and the current trend to wider spacing, the Board does not believe the minimum allowance need be designed to permit recovery of drilling costs. It believes the allowance should generally reflect recovery of well completion and operating costs and to permit an adequate return on the investment in completion costs. (The present initial economic allowance reflects recovery of drilling as well as completion and operating costs - on the cost basis of 7 or 8 years ago).

In the Board's opinion many of those reserves which would not, under quarter section spacing, warrant further drilling after completion of the discovery well may well be of limited areal extent and would be produced from the discovery well. On the other hand, if a marginal type of reservoir is of significant areal extent and if well productivity warrants it, presumably the reserve or acreage component of the balance of the allowable under the proration plan would encourage the forming of larger spacing units which could provide an allowable which would permit some further drilling. If not, the production history of the discovery well would provide the necessary record of the reserves for possible future development of them under economic circumstances warranting it.

Figure 1 in Section III shows that at the present time about 12 per cent of the provincial ultimate reserves occur in pools with recoverable reserves of less than 2,000 barrels per acre, and about two per cent below 1,000 barrels per acre. The Board believes that pools with recoverable reserves of 1,000 to 2,000 barrels per acre could be economically drilled and completed on wide spacing without dependence on the minimum allowance if allowables reflect area allocation. The Board concludes that only a very small percentage of the total reserves found would be deferred for later development or remain unexploited if drilling costs are not provided for in the minimum allowance. The Board cannot see that conservation would suffer significantly

if the minimum allowance, while permitting completion and production of a discovery well, would not by itself render attractive the drilling of follow-up wells on marginal reserves.

With respect to the relationship of the minimum allowance to depth, the Board has assessed the distribution of the presently known reserves and the presently drilled wells in the Province with depth and has made studies of the variation of completion and operating costs with depth. Figures 4 and 5 show the distribution of reserves and wells with depth and demonstrate that significant reserves and numbers of wells occur at almost all depths from 3,000 to 11,000 feet. The only depth interval not well represented is that from 3,300 to 5,000 feet. Its studies of completion and operating costs convince the Board that, other factors being equal, these costs do vary as more or less continuous functions of depth. Given the objective of the minimum allowance, the distribution of reserves and wells with depth, and the variation of costs with depth, the Board concludes that the minimum allowance should be scaled with depth. Not to scale the allowance with depth would result, the Board believes, in an allowance which at some depths and for some wells would be disproportionately high or low.

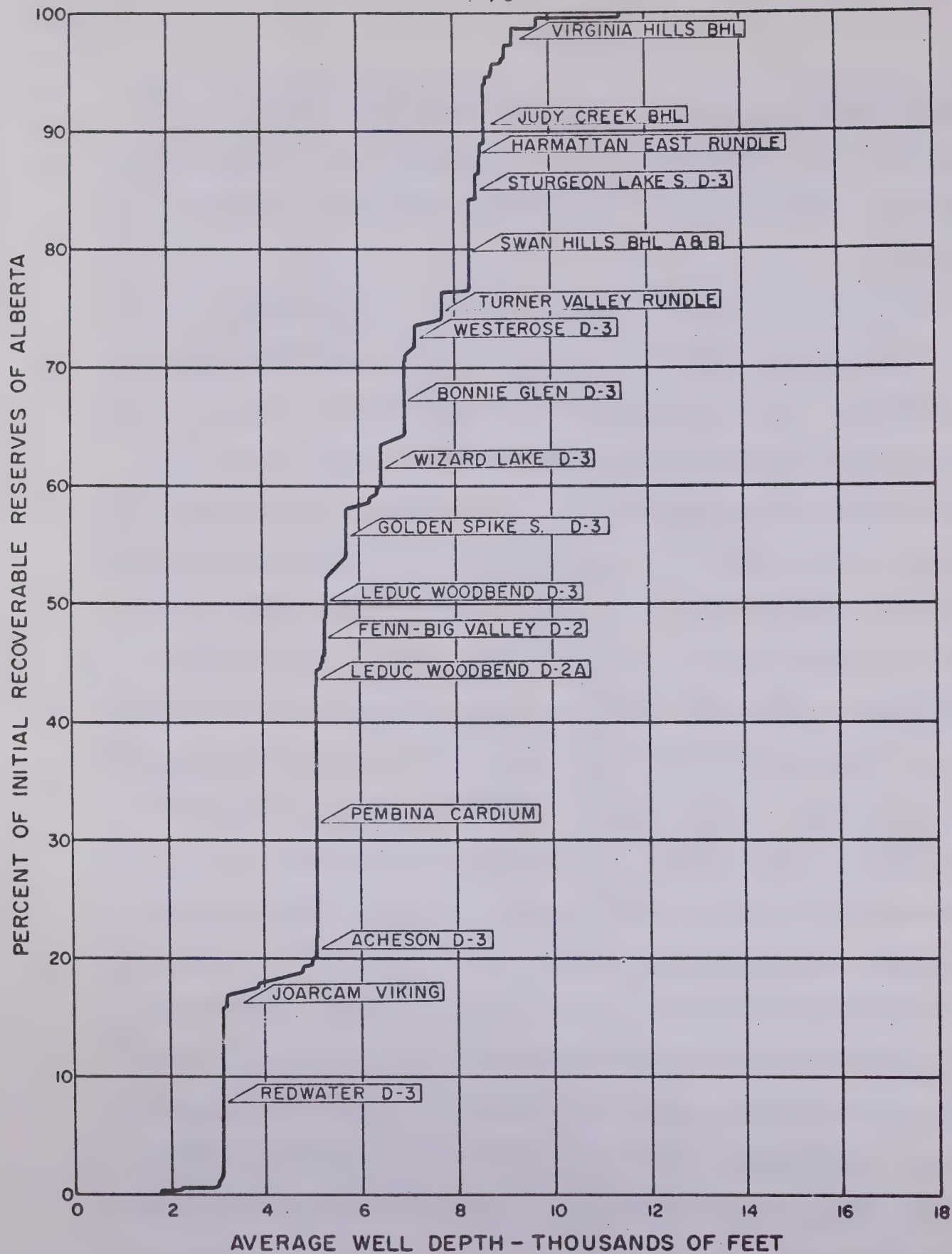


FIGURE 4-DISTRIBUTION OF ALBERTA INITIAL RECOVERABLE RESERVES BY DEPTH

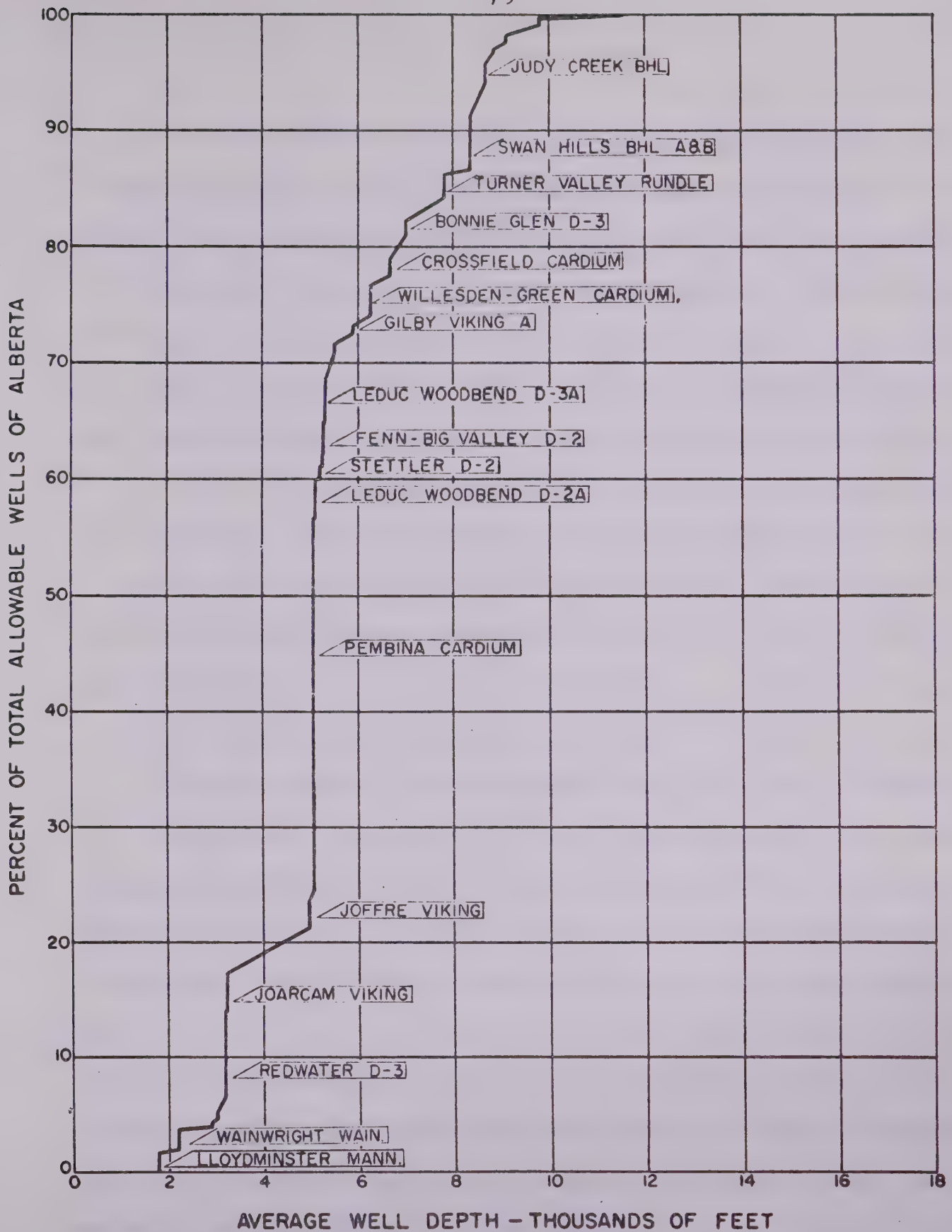


FIGURE 5 - DISTRIBUTION OF ALBERTA CRUDE OIL ALLOWABLE WELLS BY DEPTH

2. Area Dependence

(1) Views of Industry

Four of the proration plans proposed included a recommendation that the minimum allowance assigned to a well should vary with area as well as with depth. These proposals were made by Hudson's Bay, Texaco Canada, Great Plains and IPAC. In Figure 3 the magnitude and its relation to depth is shown for each of these four proposals, but only for a well on a quarter section spacing unit.

The Hudson's Bay proposal was based on a minimum allowance of 0.15 barrels per day per acre for the depth range of 0 to 4,300 feet, increasing non-linearly with increasing depth by some 0.02 to 0.03 barrels per day per acre per 1,000 feet. For wells on quarter section spacing the values closely parallel those provided by the present operating economic allowance. The proposal of Texaco Canada was for a minimum allowance calculated on the basis of 0.125 barrels per day per acre adjusted by an arithmetically scaled depth factor ranging from 1.0 at 4,000 feet to 2.0 at 12,000 feet, subject to the provision that the allowance so calculated be not less than 10 barrels per day for any well. Both Hudson's Bay and Texaco Canada advocated that their minimum allowance be allocated on the basis of productive area and that the well be eliminated as a factor in the proration system except for the provision that each tract must have one well to validate its entitlement to an allowable.

The Great Plains proposal was that its normal 160-acre minimum allowance would be altered as required for the actual size of spacing units by multiplying the 160-acre allowance by the square root of 1/160th of the acreage of the actual spacing unit.

The IPAC proposal provided that all wells drilled on less than 160-acre spacing in old pools would be allocated a basic allowance equal to the economic allowance they would receive under the present plan. It also provided that wells in old pools on 160-acre spacing and greater, and wells drilled in new pools, would have a basic allowance in proportion to the area of the spacing unit.

(2) Views of the Board

With respect to the proposals for a minimum allowance scaled to allocated area, the Board cannot accept the principle involved. The justification for the minimum allowance lies with the well, drilled on whatever spacing has been authorized. The Board recognizes the argument that the reserves attributable to a well are related to its allocated area, and the converse, that its allocated area may be a measure of those reserves, but not that its minimum allowance should be so related.

Other Features

Two other subsidiary features of a minimum allowance were discussed to a limited extent at the hearing. The first related to whether or not a minimum allowance for a

well should be an absolute minimum, or be subject to the reductions for excessive gas or water production which have been in effect for many years. On this point Great Plains recommended that, except where equity and conservation were not at issue, the allowable (including the minimum allowance, presumably) of an oil well be subject to penalties for excessive gas and water production. All other submissions made on this subject recommended without qualification that the minimum allowance be reduced when necessary in accordance with current policy.

The Board concurs with the latter view.

The second feature relates to the minimum allowance for multi-zone wells. In the present proration plan special rules provide for the allocation of a full minimum allowance to only one zone of a segregated multi-zone well. The other zones are allocated reduced minimum allowances on the basis that it would be improper to provide a pay-out of the drilling costs in each of the minimum allowances allocated to the same well. The rules provide for a single minimum allowance for commingled multi-zone wells. The subject of multi-zone well allowances was not specifically referred to in any of the primary submissions. In its response Amerada recommended that the allowable allocated to each zone of a segregated multi-zone well be the same as though a separate well was producing from each zone.

Having concluded that the minimum allowance need not

provide for the cost of drilling a well and having regard for the incremental cost of segregated multi-zone completions, the Board concurs with the recommendation of Amerada on this subject.

Board Decision

In the light of the above the Board has decided that the minimum well allowance should be of the floor type, independent of area allocated to the well, constant at 10 barrels per day to 2,000 feet and scaled exponentially with depth based on a line from 10 barrels per day at 2,000 feet to 50 barrels per day at 15,000 feet. This allowance is illustrated by the red line in Figure 3. A tabulation of the values appears in Section X. The Board believes that such an allowance would make economically attractive the completion and operation of a well drilled to a marginal reserve and that it would prevent premature abandonment of wells. The depth relationship is one which the Board thinks would result in wells at all depths receiving comparable treatment.

The allowance will be subject to gas-oil and water-oil ratio restrictions. Each zone of a segregated multi-zone well will be assigned an allowance as though it were a single zone completion. The question of transition from the present basic allowance system and the implementation of the new allowance is dealt with in Section IX of this report.

VII ALLOCATION AMONG POOLS

Introduction

The Board, in studying the submissions, found the methods proposed as a basis of allocation among pools could be broadly classified into two categories: those relating to ultimate reserves and those relating to remaining reserves. Within each of these categories, there were further significant differences between the proposals. For these reasons the Board has found it convenient to describe and discuss the various methods under the following headings:

Allocation Related to Ultimate Reserves

Ultimate Reserves without Modification

Ultimate Reserves Modified by Mobility Factor

Ultimate Reserves Modified by "Life" Factor (MPR)

Allocation Related to Remaining Reserves

Remaining Reserves without Modification

Remaining Reserves Modified by Depth

Since the emphasis placed upon these methods of allocation would be significantly affected by the magnitude and manner of treatment of any minimum allowance, comments concerning the minimum allowances proposed with each method and that adopted by the Board, are included in the discussion of the role of reserves.

The submissions regarding allocation among pools are summarized in terms of a consistent nomenclature in Table 1. The key to the nomenclature is shown immediately preceding the Table.

NOMENCLATURE

Total provincial demand for light and medium crude oil (provincial allowable)		MD
Total provincial adjusted demand		MDa
Number of wells in pool		Wp
Ultimate recoverable reserves	Provincial total	U
	Pool total	Up
Cumulative production	Provincial total	P
	Pool total	Pp
Remaining recoverable reserves	Provincial total	U - P
	Pool Total	Up - Pp
Minimum allowances	Provincial total	E
	Pool total	Ep
	Adjusted pool total	Epa
Allocation to	Pool	Ap
Depth factor	Pool	Dp
Productive acreage	Well	Sw
Summation over	Province	Σ
	Pool	Σ P
Difference between floor allowance and allocated well production, as would otherwise result from proration plan, where the former is greater than the latter		Cw
Uniform rate life (present plan)		Lp
Maximum Permissive Rate of production for pool (MPR) (present plan)		$MPRp = \frac{Up}{Lp}$
Mobility Modifier for pool		MMp

Board schedule of Initial Economic
Allowances, dated August 30, 1957

Ei

Board schedule of Operating Economic
Allowances, dated August 30, 1957

Eo

Barrels per day

b/d

Note: provincial totals refer to the total of
proratable light and medium crude oil pools.

Table 1

Summary of Proposals for Allocation Among Pools

Submission	Pool Allocation	Minimum Well Allowance		
		Type	Magnitude	
			Old Pools	New Pools
<u>Allocation Related to Ultimate Reserves</u>				
Ultimate Reserves Without Modification				
Pan American	$A_p = MDa \cdot \frac{U_p}{U} + \Sigma Cw_p$	Floor	15 b/d	Nil
British American	$A_p = MDa \cdot \frac{U_p}{U} + \Sigma Cw_p$	Floor	15 b/d	15 b/d
Socony Mobil	$A_p = MDa \cdot \frac{U_p}{U} + \Sigma Cw_p$	Floor	10 b/d	10 b/d
Texaco Exploration	$A_p = MDa \cdot \frac{U_p}{U} + \Sigma Cw_p$	Floor	15 b/d	Nil
Sun	$A_p = MDa \cdot \frac{U_p}{U} + \Sigma Cw_p$	Floor	$\frac{1}{2} E_i$ or $\frac{1}{2} E_o$	$\frac{1}{2} E_i$ or $\frac{1}{2} E_o$
Ultimate Reserves Modified by Mobility Factor				
Imperial	$A_p = MDa \frac{(U_p \times MMp)}{\Sigma (U_p \times MMp)} + \Sigma Cw_p$	Floor	7 b/d	Nil
Ultimate Reserves Modified by Life Factor				
California Standard	$A_p = E_p + (MDa - E) \frac{(MPRp - E_p)}{\Sigma MPRp - E}$	Basic	10 b/d at 3,000 ft. with linear increase to 25 b/d at 15,000 ft.	Same

Submission	Pool Allocation	Minimum Well Allowance		
		Type	Magnitude	
			Old Pools	New Pools
<u>Allocation Related to Remaining Reserves</u>				
Remaining Reserves Without Modification				
IPAC	$A_p = E_p + (MD - \sum E_p) \frac{(U_p - P_p)}{U - P}$ *Adjusted for inability to produce	Basic	If $S_w \geq 160$ acres, $E_w = \frac{S_w}{80} \times E_o$ If $S_w < 160$ acres, $E_w = E_o$ or E_i	$E_w = \frac{S_w}{80} \times E_o$
Great Plains	$A_p = E_p + (MD_a - E) \frac{U_p - P_p}{U - P}$	Basic	$E_w = E_o \times \sqrt{\frac{S_w}{160}}$	Same
Hudson's Bay	$A_p = MD_a \times \frac{(U_p - P_p)}{U - P} \text{ or } E_p,$ whichever be greater.	Floor	Barrels per acre graduated with depth (Submission, Fig. 1) eg. 160 acres at 5,000 ft. - 26 b/d	Same

Remaining Reserves Modified by Depth

Texaco Canada	$A_p = MD_a \times \frac{(U_p - P_p) \cdot D_p}{\sum (U_p - P_p) D_p}$ <p>or $D_p E_p$ or 10 b/d x W_p, whichever be greater.</p>	Floor	.125 bls/acre/day x D_p with lower limit of 10 b/d per well	Same
Shell	$A_p = E_p + \frac{(MD_a - E)(U_p - P_p) D_p}{\sum (U_p - P_p) D_p}$	Basic	15 b/d	15 b/d

Allocation Related to Ultimate Reserves

1. Ultimate Reserves without Modification

(1) Description and Characteristics

The fraction of the provincial allowable allocated to a pool under an ultimate reserves system, ignoring the effect of minimum allowances and limitations on the maximum production rate, is determined by the ratio of the pool's ultimate reserves to the provincial ultimate reserves. Stated in another way, the allocation to a pool is equal to the product of the ultimate reserves of the pool and the ratio of the provincial allowable to the provincial ultimate reserves. This latter ratio is called the allocation factor. Generally, once a pool is delineated, its ultimate reserves change only on revision of the factors determining the crude oil in place or the expected fractional recovery. Therefore, with continued growth in the provincial ultimate reserves, the ratio of the pool's fixed ultimate reserves to the provincial ultimate reserves constantly decline. However, whether the production allocated to a pool would decrease or not is dependent on the relative growth of market demand and provincial reserves, or, in other words, the trend in the allocation factor.

As a consequence of the fact that each pool would produce its ultimate reserves at the same proportionate rate, a distinctive characteristic of the ultimate reserves method is to induce uniform pool depletion rates and equivalent pool production lives at any one point in time. The extent to

which uniform pool lives would actually be achieved under the ultimate reserves system depends upon past and future trends in the allocation factor, the level and mode of operation of minimum allowances and physical or regulatory restrictions on pool productivity.

Given demand-reserve conditions that do not result in a continual decline in the allocation factor, later in the life of those pools in which productivity is sensitive to the level of depletion, the allocation is likely to approach and eventually exceed the productive capacity of the wells in such pools. In this situation, assuming sufficient remaining reserves, there could be therefore an inducement to increase or maintain pool productivity by drilling more wells or, perhaps, implementing an enhanced recovery scheme.

(2) Views of Industry

The advocates of pool allocation on the basis of ultimate reserves without modification included Pan American, Socony Mobil, British American, Texaco Exploration and Sun. Imperial favoured ultimate reserves adjusted for "mobility". In general, the argument was advanced that the use of ultimate reserves to allocate the provincial allowable among pools was eminently reasonable and would foster conservation by encouraging maximum recovery of oil in place. Specifically, it was contended that the resultant direct allowable incentive for enhanced recovery projects would favour implementation of the most efficient type of scheme.

Various among the proponents contended that an ultimate

reserve system would be administratively simple, workable over a broad range of demand, incorporate all relevant reservoir properties, represent the original assets in a pool and encourage exploration. Since the effect of allocation by ultimate reserves would be, under stable demand-reserve conditions, to approximate a uniform pool life, irrespective of the volume of pool reserves, a corollary would be that each barrel of recoverable oil would tend to have the same gross present worth at the time of discovery. Texaco Exploration considered this feature of the scheme to have particular merit in terms of achieving a reasonable distribution of the provincial allowable.

Although some proponents were adamant in their preference for an ultimate reserves allocation base over a remaining reserves allocation base, others found the choice to be a reflection of a marginal balance of advantage in favour of the ultimate reserves scheme, rather than a question of clearcut overall superiority. Amerada, in its response, considered that a combination of both schemes would best avoid the disadvantages accompanying the exclusive use of either, and therefore advocated a pool allocation base comprising an equal weighting of ultimate and remaining reserves.

Criticism of the ultimate reserves system was voiced, in the main, by IPAC, Hudson's Bay, Great Plains, Shell, Texaco Canada and Supertest. The reasonability of a scheme which included in its allocation base an item which no longer existed -

reserves already produced - and which in no way represented the current physical assets of a pool, was questioned.

Although the incentive which the ultimate reserves system provided for the institution of efficient enhanced recovery projects was acknowledged, critics said that this objective would be even better achieved under a remaining reserves scheme. It was also argued by some that exploration incentives would be higher with a remaining rather than an ultimate reserves scheme. Some of the proponents of ultimate reserves concurred with these criticisms but maintained, nevertheless, that the overall advantages of the scheme were such as to outweigh those of any alternative system.

Much comment was directed towards the fact that normally, as a pool becomes depleted, its productive capacity declines and would become less than the allocation on the basis of ultimate reserves. Such a disparity between the capacity to produce and the pool allocation was criticized as inherently unreasonable and a factor which would provide an unhealthy incentive for infill drilling, thereby unnecessarily increasing the total cost of oil production.

This situation was recognized as a defect of the scheme by some of its proponents, but certain factors were adduced to offset the incentive. These included the arguments that the opportunities for infill drilling would be curtailed as the pool approached depletion; that minimum spacing regulations could be enforced and, negatively, that overdrilling later in

the life of a pool would be less detrimental than certain facets of other proposals.

As has been discussed in Section VI and summarized in Table 1, the proponents of the ultimate reserves method other than Sun advocated minimum allowances of approximately the same order of magnitude, but differing in terms of whether wells in both old or new pools would be eligible. None of these allowances, again except that proposed by Sun, were scaled with depth. Since, firstly, all proposed that the minimum allowance be operated as a floor and secondly, the levels indicated, apart perhaps from Sun's, were low compared to others, it is evident that the companies in favour of the ultimate reserves scheme wished the predominant emphasis of the system to be placed on the reserve element in the proration formula.

(3) Views of the Board

The Board has reviewed the ultimate reserves scheme in the light of the objectives outlined in Section III, and in terms of the minimum allowance it has adopted, described in Section VI. The Board accepts the use of ultimate reserves as a reasonable basis of allocation, but it does not believe the scheme possesses a monopoly of this quality. Thus, the Board does not consider that a scheme which embraces the concept of uniform pool depletion rates is of necessity more reasonable than a proposal not incorporating this feature. The Board agrees that the system tends to encourage greater recovery of

oil in place, thereby satisfying one of the important objectives of conservation, and finds the scheme, as a method of allocation among pools to provide a relatively simple plan to administer.

The objections voiced by industry to the use of ultimate reserves based on the encouragement the system may provide to infill drill as a pool's productive capacity declines have been examined by the Board. The Board considers that primarily, the problem exists only for those pools with a capacity to produce particularly sensitive to the level of depletion, and also that the problem is not exclusive to the method of allocation by ultimate reserves. However, under this system any tendency for the problem to exist in older, more depleted pools is accentuated. Whether, under the system, the production allocated to such pools will exceed their productive capacity by a margin sufficient to induce infill drilling is dependent on the future trend of the allocation factor, which itself depends on the rate of increase in demand and the rate of increase in the provincial ultimate reserves. The Board agrees that, if the trend in the allocation factor follows the pattern anticipated by it, there will be, to some extent, an inducement to drill unnecessary wells in such pools under an ultimate reserves scheme.

It was contended at the hearing that the ultimate reserves system would encourage exploration by offering a high rate of return on prolific discoveries. Others, however, considered that the ultimate reserves system would detrimentally

affect exploration effort. It appears to the Board, however, that those who considered the adoption of this system would reduce exploration activity were essentially concerned with the level of minimum allowances which the proponents of ultimate reserves incorporated in their schemes. Although the Board believes that, with the minimum allowance it has adopted, and under current market conditions, there may be some reduction in the diversity of overall exploration activity, with, perhaps, less encouragement for exploration of a 'step out' character, it is unable to assess the impact of the scheme on total exploration.

2. Ultimate Reserves with Modification for Mobility Factor

(1) Description and Characteristics

One company, Imperial, advocated the application of a "mobility modifier" to an ultimate reserves pool allocation base. The modifier was defined as $\log_{10} (k/\mu)$

where k = the volumetrically weighted horizontal permeability of the pool, expressed in millidarcies,

μ = oil viscosity at saturation pressure and reservoir temperature, expressed in centipoises,

and the ratio k/μ had a lower limit of 50 and an upper limit of 500, resulting in a range in the modifier from 1.699 to 2.699.

Under this scheme, subject to the effect of minimum

allowances, the portion of the provincial allowable allocated to the pool is dependent on the ratio of the product of the pool's ultimate reserves and its mobility modifier to the sum of such products for all the pools in the Province.

The effect of the mobility modifier would be to give pools of high mobility an allocation equivalent, under the ultimate reserves system, to what they would have received had they possessed greater ultimate reserves. The proposed limits for the modifier would result in a pool qualifying for the maximum value of the modifier receiving approximately 1.6 times the allocation for a pool with the same reserves, but qualifying for the minimum value of the modifier. Otherwise, the characteristics of the system proposed by Imperial are those of the ultimate reserve system previously discussed.

(2) Views of Industry

Imperial contended that Alberta's land tenure system and the absence of compulsory unit operation procedures imposed limitations on spacing which would prevent pools, under an ultimate reserves scheme, from being developed on what would be their natural spacing preference. Therefore, high productivity pools would be unable to obtain the spacing advantages to which their superior deliverability entitled them. It was intended that the mobility modifier, by assigning more weight to the reserves of high mobility pools, would compensate for any such restrictions on spacing. Reserves alone would only be a sufficient basis for proration if pools

could develop equivalent productivity with, in effect, complete freedom of well spacing. The form chosen for the modifier - the logarithm of the permeability - viscosity ratio with maximum and minimum limits - resulted from a judgment approach rather than a theoretical analysis.

Most companies opposed the use of the factor. Pan American considered the modifier to be a complicated and unsound addition to the ultimate reserves system, constituting an unjustifiable subsidy to pools with favourable horizontal permeability and crude oil viscosity. Furthermore, it suggested that a double reward would accrue to prolific pools through the increased weight their reserves would have in the system and their ability to utilize wide spacing. Some critics felt that since permeability and viscosity already entered into the reserves calculation, through their effect on the recovery factor, the multiplicative effect resulting from their inclusion in the modifier would place undue emphasis on two of the many properties affecting reservoir performance.

Hudson's Bay contended that the use of the modifier would have certain haphazard incidental effects, making it unsuitable for incorporation in a proration formula. As evidence, it presented an analysis of the variation in the mobility modifier with depth, which showed two distinct groups of pools existed, both having the same mobility modifier but divided geographically and with one group at

greater depth. Hudson's Bay also contended that, as a consequence of correlation between viscosity, oil gravity and price, the modifier would result in enhancing the production of higher priced crude oils at the expense of lower priced crude oils, an effect it considered to be illogical.

The proposed formula for the modifier was objected to also on the grounds that, by having arbitrary upper and lower limiting values, it would not apply to all pools alike. Those pools outside the particular limit are treated as equivalent, those within are differentiated. Further, it was suggested that, for some pools, the value calculated would be interpretative and therefore questionable. The witness for Imperial agreed that the numbers incorporated in the formula could be subject to controversy.

Imperial proposed a minimum allowance of 7 barrels per day, to be confined to wells in old pools and operated as a floor plan. Therefore, virtually the whole emphasis in the proposed scheme would be placed upon the ultimate reserves - mobility modifier basis of allocation.

(3) Views of the Board

The Board recognizes the reasons which have prompted Imperial to propose the use of the mobility modifier. It agrees that under single or unit ownership or under spacing rules which would ensure the optimum number of wells for the desired productive capacity, a pool of high mobility would

be able to produce its allocation with fewer wells than one of low mobility. To the Board, however, this does not substantiate the claim that under the ultimate reserves system the pool should therefore have a higher allocation. Rather, it suggests that such pools should be developed initially on very wide spacing and that early efforts should be directed to unit operation. Present spacing regulations would not preclude this although the present proration plan does not foster it. The intention of the Board to provide larger production spacing units and to distribute the pool allocation on the basis of area, as described in Section VIII, will promote development on the optimum spacing. Thus, the Board does not believe the mobility modifier is a suitable factor to be included as a determinant of the pool allocation in the new proration plan.

3. Ultimate Reserves Modified by Life Factor (MPR)

(1) Description and Characteristics

California Standard advocated that MPR's be retained as a basis for proration. Under an MPR system, ignoring the effect of minimum allowances and limitations on the maximum production rate, the fraction of the provincial allowable allocated to a pool is determined by the ratio of the MER or MPR of the pool to the sum of the MER's and MPR's of all pools producing prorated crude oil. California Standard proposed a modification to this system by determining the pool allocation on the basis of the ratio of the pool's residual MPR to the sum of the residual MPR's of the province, where the residual MPR is defined as the difference between the pool MPR and the pool minimum allowance. This procedure parallels the

present proration scheme, although with the level of minimum allowances advocated by California Standard, the difference between using the residual MPR rather than the MPR as the basis of allocation would not be so significant.

Where a pool MER based upon an analysis of the pool recovery mechanism is not set, the pool MPR is determined as the ultimate reserves of the pool divided by the number of days in an estimated "uniform rate life" for the pool. The life in turn is estimated having regard primarily to rate of pressure decline, well spacing, permeability, viscosity and pay thickness. Present practice sets the life as approximately 10 years for all pools on 40-acre spacing and for pools of very favourable characteristics, such as the Golden Spike South D-3A Pool, regardless of spacing. For wider spacing and less favourable characteristics, the life is extended to a degree dependent upon the spacing, and the characteristics. The range of "lives" employed in the Board's present MPR formula is from about 8 years to some 40 years.

The MPR system thus is seen to be an ultimate reserves system modified by a life factor in turn dependent on spacing, pressure decline, permeability, viscosity and pay thickness.

(2) Views of Industry

California Standard submitted that the proration plan should reflect both the varying productivity of pools and the reserves they contain. Regarding the present MPR formula, California Standard considered the life factor the only feature open to question, but one which it was prepared to accept at present.

The preponderance of criticism by industry of the MPR

system lay with its focus on the well and the effect of spacing variations on the determination of MPR's. Imperial considered potential to constitute a sound basis for prorating, but could not recommend the MPR for this purpose, with the invitation to inefficient practices through its emphasis on wells. The progressive reduction in allocation per acre to pools developed on greater than 40-acre spacing, resulting from the application of the MPR as presently calculated, was criticized by Pan American. This criticism was endorsed by Socony Mobil, Texaco Exploration and Hudson's Bay. In reply to arguments that the MPR system would provide an incentive to improve the life factor by close spacing, California Standard contended the Board had adequate powers to regulate well spacing, and that the economics of infill drilling would not necessarily be favourable. Furthermore, it stated, the recovery and the life factor would be improved by the initiation of secondary recovery projects, and thus encouragement would be provided for an alternative investment in schemes of this nature, rather than for infill or closely spaced drilling.

California Standard claimed the scheme would discourage the development of what it considered to be marginal pools, thereby releasing additional funds for exploration. Hudson's Bay contended that it was not desirable to suppress the development of any particular type of reserve, and that the use of MPR's might preclude the development of low reserve per acre discoveries on wide spacing.

The Board estimates that, under current market conditions, the basic allowance proposed by California

Standard would absorb only about one-third of the current market demand, and thus considerable weight would be placed on MPR's in the formula.

(3) Views of the Board

Although the MPR has been a factor in proration since its inception in Alberta, the Board now recognizes several undesirable features inherent in its use.

The MPR is an estimate of the maximum rate at which a pool should be produced having regard to conservation and engineering considerations and recognizing the well spacing in effect and the developed productivity. The recognition of productivity in the allocation base promotes the development of unneeded productivity, generally through overdevelopment, and hence is contrary to the objective of optimum economic development. In addition, the life factor modifier has much the same features, when applied to pools of the same spacing and pay thickness, as has the mobility modifier proposed by Imperial. The Board has not found these features such as to warrant modification of an ultimate reserves system. Moreover, the Board recognizes that a system incorporating a life factor would adversely affect the development of low permeability pools, especially those with low reserves per acre.

The MPR system also suffers from the need for estimation of a suitable life factor and, despite the Board's efforts

to make such estimates on a sound technical basis, the Board must agree with most of the industry that the present method has a good many shortcomings. The life factor would become of major significance in an MPR system employing a minimum allowance of the magnitude the Board has now adopted and thus the controversy and discussion involved in its establishment would undoubtedly be more extensive than with the present plan.

For these reasons the Board dismisses the idea of allocation of the provincial allowable among pools on the basis of MPR's.

Allocation Related to Remaining Reserves

1. Remaining Reserves without Modification

(1) Description and Characteristics

Under a remaining reserves system, disregarding the influence of minimum allowances and maximum production rates, the fraction of the provincial allowable allocated to the pool is equal to the ratio of the pool's remaining reserves to the provincial remaining reserves. The allocation factor would be defined as the ratio of the provincial allowable to the provincial remaining reserves, and thus the pool allocation may be also considered as the product of the pool's remaining reserves and the allocation factor. The pool allocation base is subject to adjustment on two accounts: revisions of the pool's ultimate reserves attributable to changes in reservoir properties and the recovery factor,

and progressive subtraction of production as the pool is depleted. The frequency of the adjustments for production would probably not be more than once a year and could be once every two, or more, years.

If the effect of such factors as minimum allowances and limitations on the maximum producing rate are ignored, with a remaining reserves scheme, production is allocated to pools in such a manner that at any point in time each pool's life index is equivalent to the overall provincial life index. Hence, since the pool production rate is directly determined by the provincial life index, the productive life of each pool is theoretically extended until such time as all the reserves in the Province are exhausted. This characteristic of the method would prolong the life of pools discovered relatively early in the production history of the Province. As the remaining reserves of a pool decline to a low figure, the allocation to it could be so small as to fall below the economic production rate, thus rendering the pool uneconomic. For this reason, and to prevent inordinate elongation of pool life, the system would probably require some kind of minimum allowance. The level of any such minimum allowance has considerable effect on the nature of the remaining reserves system, particularly with regard to any tendencies toward elongation of pool lives and possible unreasonably low pool allocations. The higher the minimum allowance, the

less likely any extension of pool lives, since the dependence on remaining reserves as a determinant of the pool allocation is less.

(2) Views of Industry

Great Plains, Hudson's Bay, Texaco Canada, Shell and IPAC supported the remaining reserves scheme, although the weight given to the reserves factor varied with the level of minimum allowances proposed and the manner of their application. This qualification is particularly important in the case of IPAC's proposal. Furthermore, Texaco Canada and Shell both proposed that the remaining reserves allocation base be modified for depth. The arguments concerning the application of the depth factor are discussed in a separate section below.

The system was opposed, in the main, by the advocates of an ultimate reserves allocation base: Pan American, Imperial, Socony Mobil, Texaco Exploration, British American and Triad.

Hudson's Bay and Great Plains, in particular, expressed their preference for remaining reserves as a matter of principle. They claimed the pool allocation should be based on the volume of oil from which it can be produced, and, with Shell, that remaining reserves constituted the most realistic measure of the supply of oil to be prorated. When the witness for Hudson's Bay was asked to reconcile variations in pool productivity with his belief that supply and remaining reserves were virtually synonymous, he agreed

that deliverability was also a factor, but considered that it was important only when demand was close to capacity and that in situations other than this, remaining reserves were a reasonable measure of supply. Most of the proponents placed considerable emphasis on the incentives a remaining reserves scheme would provide for exploration and for the implementation of enhanced recovery projects. Some critics of the system agreed that the initial allocation advantage the scheme gave to increases in reserves would exceed the allocation under an ultimate reserve scheme, but, Imperial in particular argued further that this feature could, in the case of new discoveries, result in too rapid development of a pool. The proponents contended that an additional advantage of the proposed allocation base, in comparison with the ultimate reserves base, concerned the consistency between the allocation as determined by remaining reserves and pool productivity. It was therefore argued the retention of high allocations by pools nearing depletion, which would constitute a problem under the ultimate reserves system, would be prevented.

Much criticism was directed towards the extension of pool lives under the remaining reserves scheme, beyond what was considered to be a reasonable period. It was further argued that the scheme would necessitate a minimum allowance, whether desirable for other reasons or not, both to avoid any such elongation of pool lives and to

prevent unreasonably low allocations when a pool's reserve was nearly depleted. The witness for Hudson's Bay contended that this latter feature was not a serious deficiency. Additional objections were voiced on the grounds that a pool allocation under the system would be high initially and thereafter decline. Thus there was an inducement, early in a pool's life, to develop greater capacity than subsequent allocations would justify. In reply, Great Plains and others argued that whether a pool allocation suffered progressive reductions or not was a consequence of future trends in the allocation factor. Current forecasts, it was argued, indicated trends of demand and additions to reserves which would result in increasing rather than declining pool allocations. Furthermore, surplus capacity would probably be installed when a pool is first developed under any system, since it is necessary to drill wells to define a pool, to provide efficient drainage, and to safeguard correlative rights.

The administrative details of the system, which were felt by some opponents to be onerous, were not considered by the proponents to be any greater than those of the ultimate reserves system.

The weight that IPAC, Great Plains and Shell wished to be placed on the remaining reserves element in their respective schemes is indicated by the proportionate share of the provincial allowable remaining for allocation after

the application of the basic allowances each proposed. The Board estimates the basic allowance proposed by IPAC would absorb the greater part of the current provincial allowable; that proposed by Great Plains, the Board anticipates, would result in roughly equal weight being given to remaining reserves and its basic allowance. Shell's basic well allowance of 15 barrels per day would result, the Board expects, in about one-third of the current provincial allowable being distributed by application of this allowance.

Texaco Canada and Hudson's Bay each proposed floor allowances, based on acreage and depth. Both schemes would result in considerable emphasis being placed on the remaining reserves factor, or, more accurately in the case of Texaco Canada, on remaining reserves modified by depth. The level of minimum allowance advocated by Texaco Canada was relatively low; that proposed by Hudson's Bay was somewhat higher.

(3) Views of the Board

The Board has reviewed the remaining reserves scheme in the light of the objectives outlined in Section III and in terms of the minimum allowance it has adopted.

In the opinion of the Board, whether minimum allowance is desirable on other grounds or not, the use of the remaining reserves allocation base requires the inclusion of such an allowance since, in its absence, the scheme

tends to accord to each pool, irrespective of the date of discovery, the same remaining years of life, a result the Board believes to be unreasonable. The Board considers there is no necessary reason why the minimum allowance it has adopted, which was designed to satisfy certain other objectives, would also be the appropriate one to prevent unreasonable elongation of pool lives.

The initial increase in pool allocation resulting from additions to the reserves of the pool would undoubtedly be greater than that afforded under the ultimate reserves system, and, to this extent, the stimulus for early implementation of enhanced recovery schemes is greater under the remaining reserves system. However, the Board believes that the remaining reserves system would perhaps provide undue benefits to new reserves, resulting either from enhanced recovery schemes or the discovery of new pools. This comment follows from the fact that, within certain limits, even though demand may be increasing at a greater rate than either ultimate or remaining reserves, as a consequence of the weight given to new reserves under this system, allocations to other pools can decline, whereas it would appear reasonable to expect all pools to participate in the growth of the market-reserves ratio.

Although some critics said the method was administratively complicated, the Board does not believe that such complications as do exist in comparison with other schemes are sufficient

to warrant serious consideration. The Board agrees the use of the remaining rather than the ultimate reserves system, would avoid, under current market conditions, allocations to older pools being of a magnitude sufficient to encourage unnecessary drilling or unnecessary re-works to be carried out to improve productivity late in a pool's life. However, in the Board's opinion, the situation where the pool allocation may consistently exceed its productivity is not confined to when the ultimate reserves system is used. With the remaining reserves system and its higher allocations for new and more recently discovered pools, for those new pools whose productivity is particularly sensitive to depletion, the point in time at which the pool allocation exceeds pool productivity may be reached somewhat earlier than if the allocation to such pools were determined by ultimate reserves, on the basis of the present Board forecasts of demand and reserves.

The argument that the remaining reserves method would lead to early overdevelopment of new pools has been examined by the Board. It was contended that a remaining reserve allocation base would provide high initial allocations, but, with the pool being progressively depleted, subsequent allocations would decline. Hence, throughout its life, an increasing proportion of the pool's producing capacity would be rendered superfluous. The Board finds that this argument is dependent, in the first place, on

the relationship between future total demand, the future level of provincial remaining reserves, and the level of minimum allowances. On the basis of the Board's present forecasts, it appears there is a greater tendency for certain pool allocations to decline with the use of the remaining rather than ultimate reserves, as a consequence of the weight given to new reserves under the former. However, the Board does not consider this feature particularly significant, because reductions in the pool allocation may not be sufficiently rapid for surplus capacity to be apparent, in view of the productivity decline characteristics of some pools, and because requirements to delineate a pool and protect correlative rights may result in excess capacity, irrespective of the proration system adopted.

The Board believes that, with the level of minimum allowances it has adopted, its comments concerning exploration under the discussion of ultimate reserves apply in a similar way to the remaining reserves system. However, some modification is appropriate in view of the greater initial weight given to new discoveries by the scheme, which could therefore result in a more rapid initial receipt of income to the operator. Hence those companies to whom this factor is a particularly important determinant of their exploration effort would receive more encouragement to explore under a remaining rather than an ultimate reserve scheme.

2. Remaining Reserves Modified by Depth

(1) Description and Characteristics

Two companies, Shell and Texaco Canada, proposed that the remaining reserves allocation base be modified by depth. The depth factor advocated by Shell reflected an exponential increase, commencing at 1.0 at a depth of 7,500 feet, rising to 2.0 at a depth of 13,000 feet; that of Texaco Canada reflected a linear increase from 1.0 at 4,000 feet to 2.0 at 12,000 feet. The basis for both factors was principally judgment, although Shell's was indirectly related to an eight-year payout of exploration, land acquisition and development costs.

Under each system, the pool allocation base is the product of the pool's remaining reserves and the appropriate depth factor. The portion of the provincial allowable allocated to the pool would be determined by the ratio of the product of the pool's remaining reserves and the appropriate depth factor to the sum of such products for all the proratable pools in the Province. The depth factor, in effect, would result in the deeper pools receiving an allocation equivalent to what they would have received under a remaining reserves scheme, had their reserves been somewhat greater.

(2) Views of Industry

Both proponents of the depth factor as applied to remaining reserves emphasized the encouragement it would

provide for exploration at deeper depths and the fact that increasing costs with depth should be recognized. Deeper wells required greater investment, a higher production rate and probably higher reserves. Before an operator will explore for new reserves an adequate minimum return on exploration, land acquisition and development costs should be ensured. Shell considered the application of the depth factor to the reserves element in the proration system would result in a system sensitive to fluctuations in supply and demand. When questioned on whether an incentive for deep drilling would be, in effect, an encouragement for the least economic type of venture, the witness for Shell replied that although oil at depth would be more costly, the incentive would be justified to maintain supply, of which Shell anticipated a future deficiency. Deeper sediments were considered to constitute a probable source of new discoveries.

A suggestion that wider spacing for deeper reservoirs would obviate the need for a depth factor was believed by Shell to be an inadequate solution to the problem, since it considered the prevalent spacing for most discoveries at depth would be 160 acres, and thus there would be no opportunity to utilize wider spacing. Imperial argued that no advantage should be accorded to one area over another on the basis of depth; it saw no valid reason why new plays should be discriminated by depth, with deeper discoveries receiving a substantially greater reward than

exploration successes at shallower depth. Texaco Exploration considered the application of the depth factor would increase the value of deep reserves vis-a-vis similar, shallower reserves; depth was only one of several factors influencing the value of crude oil reserves and as it was impossible to account for all these variables in the proration method, Texaco Exploration said it would be inequitable to compensate for any single factor.

(3) Views of the Board

The Board does not believe it appropriate to compensate for higher costs incurred at depth by increasing the weight of the pool allocation base in the proration system. If a depth factor were applied, as proposed, to a pool's remaining reserves, any increased allocation a pool might receive over what it would have been allocated without the modification for depth, would be only indirectly related to the costs it was designed to recoup. To the extent that the proration system should recognize the higher costs associated with greater depth, the Board considers this objective to be better achieved by a more specific measure, such as a minimum allowance graduated with depth, than by adjusting the reserve component in the proration formula.

Board Decision

The Board is of the opinion that the basis of allocation among pools should be reserves, without modification by mobility, life or depth factors. In determining whether

ultimate or remaining reserves would be more suitable, the Board has weighed the main characteristics of both systems as summarized in the paragraph below.

As discussed earlier in the section, the remaining reserve system appears to be slightly more complex from an administrative point of view than the ultimate reserves system. With the use of ultimate reserves there is a tendency towards uniformity of pool lives, while the remaining reserves system tends to elongate pool lives. Both systems provide incentives for exploration and institution of enhanced recovery schemes, with the greater encouragement being provided by remaining reserves. Some danger of late overdevelopment in old pools exists with the ultimate reserves system while conversely there appears a slight possibility that the remaining reserves system can result in early overdevelopment of new pools. Under either system pool allocations can exceed pool productivity. For older, more depleted pools, a pool allocation under an ultimate reserves system would always exceed its allocation under a remaining reserves system, while for new pools, given the Board's reserve forecast, the converse situation tends to arise. Therefore, for those pools whose productivity is sensitive to the level of depletion, any tendency for the pool allocation to exceed pool productivity is more noticeable for older pools under an ultimate reserves system, and although to a lesser extent for newer pools under a

remaining reserves system. Ultimate reserves may be said to be related to original assets, whereas remaining reserves reflect current assets. Under an ultimate reserves system an increasing allocation factor over time is reflected by a corresponding increase in pool allocations. This is not necessarily the case under a remaining reserves system.

Having regard to the characteristics of the two systems, the Board has decided that a composite pool allocation base, with an equal weighting of ultimate and remaining reserves would best reflect the advantages and minimize the disadvantages associated with each. This is the system advocated by Amerada in its submission of response.

The use of 50 per cent of a pool's ultimate reserves and 50 per cent of its remaining reserves as the pool allocation base is mathematically equivalent to using the pool's ultimate reserves less 50 per cent of its cumulative production. This latter expression permits greater ease of computation.

The plan will apply alike to old and new pools. Ultimate reserves will be established annually following a public hearing and 50 per cent of the cumulative production will be deducted annually. An appropriate simplified method will be used for dealing with new discoveries, new pools, new enhanced recovery schemes and significant development within pools taking place between

annual reviews.

Defined in terms of the standardized nomenclature introduced at the beginning of this section, the Board plan is:

$$Ap = MDa. \frac{(Up - Pp/2)}{(U - P/2)} + \frac{\Sigma Cw}{p}$$

VIII DISTRIBUTION WITHIN POOLS

Introduction

The problem of distributing the pool allocation among the wells in the pool arises following the allocation to the pool of its share of the provincial allowable. Where an entire pool is subject to a single unit operation, the distribution of the benefits of production is predetermined by the unit agreement. Where portions of a pool are operated as units or projects and others are not, the pool allocation must be distributed among the primary non-unit wells and to the unit and project portions. The recent growth in enhanced recovery schemes has resulted in an increased number of pools and portions of pools receiving unit or project allocations. The Board expects this trend to continue with the result that an increasing number of pools and portions of pools will not require their allocation to be distributed among the individual wells. Thus in summary, consideration of the distribution of the pool allocation is only necessary in pools and portions of pools under primary non-unit operation and pools involving more than one enhanced recovery scheme or unit.

The Oil and Gas Conservation Act requires that if the Board prorates to market demand, it distribute the pool allocation among the wells in the pool "in an equitable manner". Basic to the consideration of the merits of various systems of distribution of the pool allocation to the wells within the pool is the question of what would be "an equitable manner". At the hearing many of those making submissions contended that

the methods which they proposed were equitable but there was little evidence on the fundamental issue of exactly what would constitute equitable distribution.

It was contended by Texaco Exploration that the basis of allocation within pools should be the same as that among pools and that the use of different bases would be highly inconsistent.

Imperial and Socony Mobil emphasized the distinction between the Board's responsibilities as defined in section 36 of The Oil and Gas Conservation Act to allocate the provincial allowable "in a reasonable manner" among pools and to distribute within pools "in an equitable manner". Pan American contended that allocation on its suggested bases (among pools on ultimate reserves and within pools on area) satisfactorily fell within the terms of section 36 of the Act. Others also, whose plans included different bases for distribution among pools and within pools, expressed no concern with the inconsistency seen by Texaco Exploration.

The Board agrees with Imperial, Socony Mobil and Pan American, that there is no requirement under the Act nor any other compelling reason that distribution within pools should be on the same basis as allocation among pools.

As the Board sees it, distribution "in an equitable manner" would require distribution according to rules formulated to operate fairly among wells and applied equally to all wells in a pool. The Board is unable to define more closely a single standard of equitable distribution. It believes however, that

to meet the standards imposed by this definition, the distribution would have to be reasonably compatible with the reserves attributed to, and the productive lives of, the wells.

Nine submissions were received on the subject of within pool distribution. In addition, a number of others touched upon the matter either directly or by implication. The various plans proposed may be grouped under the two general headings of ultimate reserves and area. The Board has evaluated each of the methods proposed for distributing the pool allocation within a pool independently of the methods proposed for allocating the provincial allowable among pools having regard to the overall objectives of proration as set out in Section III of this report and to its interpretation of "an equitable manner".

Ultimate Reserves Method

(1) Description and Characteristics

In the ultimate reserves method of distribution of the pool allocation among the wells in the pool, each well, subject to the effects of any minimum allowance and any restriction on maximum well rates, receives a fraction of the total pool allocation equal to the ratio of the ultimate reserves attributable to the well to those of the pool. In principle the method involves the establishment for each well of

- (a) an allocated area,
- (b) the average pay thickness effective over the allocated area,

(c) the average values of porosity, connate water and formation volume factor effective over the volume as determined by the product of items (a) and (b), and

(d) the recovery factor effective over the volume.

In practice lack of detailed knowledge of reservoir properties or the near uniformity of certain of them could necessitate or suggest the use of pool average values for some or all of items (b), (c) and (d). In fact, if uniform values existed for all of items (b), (c) and (d), the method would reduce to the area method discussed later.

For fully developed pools on uniform spacing and on primary non-unit operation, the area allocated to a well is the uniform spacing area. In other cases the determination of the allocated area involves certain complications. These, being common to all methods proposed for allocation within pools, are discussed later under the heading "Area Allocated to Wells".

An inherent characteristic of the ultimate reserves method, for pools in which the productive lives of all wells are the same, is that each well tends to recover the ultimate reserve underlying the area allocated to it. Such, however, is not the case for pools in which the productive lives of wells are not the same, as occurs with many bottom water drive pools or inclined pools subject to expanding gas cap drive.

Another characteristic of the method is its inherent complexity arising from the need for the determination of the ultimate reserve attributable to individual wells.

(2) Views of Industry

The advocates of ultimate reserves as a basis of distributing within pools included Great Plains and Texaco Exploration. Great Plains argued that the advantage of an ultimate reserves plan is that it would afford reasonable opportunity for a well owner to produce the ultimate reserves attributable to his well and would provide a buffer against lease-line drainage. It also argued, presumably in reference to the present prorating system, that there is little justification for attributing to each well within a pool the average of the ultimate reserves of all wells in the pool.

Texaco Exploration contended that the basis of allocation both within pools and among pools should be ultimate reserves, and that the use of different bases would be highly inconsistent. It acknowledged that the ultimate reserves method might be inappropriate in old pools where unit operations have been established on different bases. It also agreed that the method was not particularly appropriate for bottom water drive or gas cap drive reservoirs and indicated that an area method might be preferable for such pools.

Triad suggested in its response that an ultimate reserves system might be desirable from the standpoint of equity.

Pan American, IPAC and Hudson's Bay saw gross complexities arising out of any attempt to employ the ultimate reserves system. Imperial believed it contained insurmountable problems in practice, even though it might appear reasonable

in theory.

(3) Views of the Board

The Board recognizes that for pools in which wells have uniform productive lives and similar structural position the ultimate reserves system would come about as close to meeting the requirement of equitable distribution among wells as could be expected. To the extent, however, that well lives and structural position within a pool do vary, as in certain bottom water and gas cap expansion drive pools, the ultimate reserves method may fail and in the direction of some deprivation of opportunity from the shorter lived wells and, where well lives are the same, from wells having advantageous structural position.

In addition to its inherent complexity as previously mentioned, the Board considers the ultimate reserves system for distribution of pool allocations to wells to have the further disadvantage of requiring detailed and well-by-well interpretation of reservoir data. This could lead to controversy and would certainly make the system burdensome and costly to administer.

Area Method and Modifications

(1) Description and Characteristics

The area method of distribution of the pool allocation among the wells of the pool results in each well, subject to the effects of any minimum allowance and any restriction on maximum well rates, receiving a fraction of the total pool allocation equal to the ratio between the area allocated to

the well and the total of the areas allocated to all wells in the pool. Like the ultimate reserves method, it requires the allocation of an area to each well - a simple matter for fully developed pools on uniform spacing under primary production, but more complicated in other cases.

For pools of uniform or nearly uniform characteristics the method is equivalent to the ultimate reserves method and has the characteristics of that method. For pools exhibiting significant variations in pay thickness, porosity, connate water, or recovery factor, all wells do not necessarily receive equal opportunity to recover the ultimate reserves that might be attributed to them.

A further feature of the area method, as compared with the ultimate reserves method, is its relative simplicity since the interpretation of subsurface data on a well-by-well basis is unnecessary.

The area method may be modified by incorporating one or more of the reservoir properties or the recovery factor employed in the ultimate reserves method. Thus an area-thickness, an area-thickness-porosity, an area-recovery factor or other modifications could be considered. Of these possibilities only the area-recovery factor modification was discussed at the hearing and discussion was restricted to the use of separate recovery factors for those portions of a pool under the separate recovery mechanisms resulting from the introduction of enhanced recovery operations in portions of a pool.

Under the area method modified for recovery factor, as

discussed at the hearing, each well, subject to the effects of any minimum well allowance and any restriction on maximum well rates, receives a fraction of the total pool allocation equal to the ratio of (a) the product of its allocated area and the applicable recovery factor to (b) the sum of the products of allocated areas and applicable recovery factors for all wells in the pool. This modification of the simple area method would better provide wells in portions of a pool subject to different recovery mechanisms an opportunity to recover the reserves attributed to each of them. A slight disadvantage of the method is that it would require estimation of recovery factors for each enhanced recovery area.

(2) Views of Industry

Use of an area method for distribution within pools was advocated by Pan American, British American, Imperial, IPAC, Hudson's Bay, Socony Mobil and Amerada. Also a form of area method was proposed by Shell. In general it was claimed that the great advantage of the area system is its simplicity.

Pan American testified that it regarded the area system as an average or simplified ultimate reserves system and that it regarded the true ultimate reserves system as being ideal but too complex to be practical. Socony Mobil viewed the matter similarly.

Hudson's Bay testified that the area system is the most reasonable having regard for the many types of pools to be dealt with. Furthermore, it regarded the area system it proposed and the present method of distribution within pools

as being much the same, and it considered this as an added argument favouring adoption of the area method.

IPAC advocated use of the area method but argued against the adoption of a recovery factor modifier for those cases where a variety of recovery mechanisms may be in operation. It argued that the recovery factor modifier is only one of a number of factors which might be adopted. It believed that adequate incentives to conduct enhanced recovery operations already exist through improved and sustained productivity and increased ultimate production.

Those proposing the use of the recovery factor modifier for pools subject to more than one recovery mechanism included Pan American, Hudson's Bay, and Socony Mobil. They submitted that this system would recognize and encourage the implementation of the more efficient enhanced recovery processes.

Shell appeared to favour recognition of improved recoveries provided by enhanced recovery projects.

(3) Views of Board

The Board believes that an area method of distribution has a number of advantages as well as certain disadvantages when compared with the ultimate reserves method. In the first place, the method is simple and does not involve interpretation of reservoir factors for individual wells. As compared with the ultimate reserves system the method does seem to provide a fairer opportunity for shorter lived wells to recover reserves that could be attributed to them. It

also permits wells having advantageous structural position to reap some benefit from this position. A further advantage is that under an area system in a pool where the life of each well is proportional to its formation thickness and where other reservoir properties and recoveries are similar, the system would permit aggregate production in proportion to the reserves underlying the areas allocated to the wells. On the other hand where reservoir properties vary significantly from well to well and where productive lives are similar the method does not provide, to the extent that the ultimate reserve method would, the opportunity for each well to recover the reserves that might be attributed to it. The same applies to situations where through enhanced recovery operations different recovery factors are applicable in different areas.

All things considered, the Board believes that an area method modified by recovery factor for portions of a pool subject to different enhanced recovery mechanisms is the best method of distributing the pool allocation. The Board considers the use of the recovery factor modifier to be essential for pools subject to more than one recovery mechanism both to achieve a more equitable distribution and to encourage improved recovery efficiency - one of the basic objectives set out in Section III. Moreover it is noteworthy that, of the various factors affecting the reserves attributable to a well, the area method modified for recovery factor incorporates those two factors over which the operator has

some control, area and recovery factor.

The detailed manner of determining recovery factor modifiers was not discussed at the hearing. The Board believes it would be proper to determine the recovery factor for any particular enhanced recovery mechanism by assuming the mechanism to be applied to the pool as a whole. The recovery factor so determined would be used as the modifier for the area of the pool subject to the recovery mechanism.

Productivity Index Modifier

(1) Description and Characteristics

National Petroleum proposed that, whatever system be adopted for distributing a pool's allocation among wells, a productivity index modifier be incorporated to promote greater conservation. With such a modifier a well, subject to the effects of any minimum allowance and any restriction on maximum well rates, receives an allowable equal to that which it would have otherwise received multiplied by the ratio of its productivity index to an appropriate average such index for all wells in the pool.

The effect of such a modifier is to shift some allowable from the lower to the higher productivity index wells.

(2) Views of Industry

National Petroleum contended that the success of well completion with respect to the available productive zone would be determined by periodic pressure drawdown tests on

the well. It submitted that use of a productivity index modifier would promote "total completion" of wells (exposure and stimulation of all productive layers) which in turn would lead to reduced well bore drawdown, improved use of reservoir energy and thereby greater oil conservation.

Great Plains contended in its response that distributing on the basis of productivity index would be unreasonable not only because it would lead to development of unnecessary well capacity but also because it might lead to reduced ultimate recoveries by virtue of inducing coning which otherwise would not have occurred.

Pan American in its response criticized use of the productivity index on the grounds that it is not a measure of reserves and that it would be difficult to determine in a way as to avoid discrimination. It added that the productivity index modifier would result in production on the basis of the "rule of capture".

Socony Mobil objected to the productivity index modifier on the ground that it would not contribute to conservation.

Pacific stated in its response that such a modifier is not justified because it bears no relation to reserves, is not warranted at a time when provincial productive capacity greatly exceeds market demand and that it would be a complicating feature.

(3) Views of the Board

The Board agrees with National Petroleum that the manner of completion of wells can influence ultimate recovery and

that this is particularly the case with stratified pools. The Board believes, however, that there are natural incentives for improved well completions through lower production lifting costs and reductions in the number of wells needed to provide required productivity. Also it believes that improvements in recovery which might result from improved well completion in entire pools or significant portions could be taken into account as an enhanced recovery scheme if the improved recovery could be satisfactorily demonstrated.

For these reasons the Board is not prepared to incorporate a productivity index modifier into the basis for prorating within pools.

Area Allocated to Wells

(1) Introduction

The Oil and Gas Conservation Act presently defines a spacing unit as the area allocated to a well for the purpose of drilling for or producing oil or gas. The area allocated for drilling is, under the present regulations, identical to that employed for regulation of production. The Drilling and Production Regulations issued under the Act currently define the normal spacing unit for oil wells as one quarter section and provide for the setting, upon application and after public hearing, of other than normal spacing units.

(2) Views of Industry

Imperial proposed allowing some flexibility in oil well spacing. It suggested that variable spacing should be

developed cautiously so that, initially, no new regulatory provisions of any consequence will be added and mineral interests will not be forced into pooling any more than is the case today. To achieve this objective, it recommended that applications for well spacing within the limits of one quarter section and one section be handled in the individual well licence applications. Area included would have to be of uniform ownership and be comprised of standard quarter section tracts. Spacing greater than one section or less than one quarter section would first be considered at a public hearing. Imperial maintained that its procedure would provide for closer spaced wells where geology, mineral titles or productivity are influencing factors, and at the same time allow wider spaced wells where they were appropriate.

Pan American in its submission also advocated granting oil well spacing of from one quarter section to a maximum of one section, but it suggested that applications should be dealt with under the present regulations which require a public hearing before the designation of other than normal spacing units. Pan American testified that it envisaged spacing units of varying sizes and shapes for new pools. In addition, it would assign further area to wells for production purposes on the strength of combined geologic and seismic information. The manner of assignment of the additional area was not explained.

British American also advocated adoption of variable

well spacing to be administered within the present regulations. It stated that it envisaged well spacing of up to one section with infill drilling where necessary on half section spacing. When questioned, its witness stated that he believed that future development on variable spacing would lead to reasonably uniform patterns rather than to clustering of wells.

Hudson's Bay tendered a plan whereby current well spacing regulations would apply for the drilling of wells during pool delineation. After a well has been drilled, additional area could be allocated to the well in the form of full spacing units located between drilled spacing units in accordance with a prescribed set of rules. The additional area allocated would be called "validated acreage". Hudson's Bay testified that its area validation procedures, restrictions and qualifications might require revision of the present regulations. It also introduced the concept of a "proratable tract" to apply to the total area assigned to a well for production purposes. The proratable tract would contain a maximum of one section made up of laterally adjoining spacing units, be of uniform ownership, contain one or more wells, lie within an area not more than approximately one mile by two miles and contain only validated spacing units. For wells drilled off-pattern only the fraction of the spacing unit area normally allocated in accordance with the regulations would be classed as validated acreage. Complete intervening spacing units could

still be assigned to the proratable tract containing the off-pattern well.

Texaco Canada testified that it supported the concept of variable spacing, though it offered no specific suggestions for the allocation of area to wells.

Great Plains and IPAC advocated continuation of the present standard well spacing regulations, and Shell viewed the present standard quarter section spacing as appropriate to delineate and exploit most oil reservoirs.

(3) Views of the Board

The Board concurs with the majority view of industry that additional flexibility in well spacing is desirable especially as it affects the area allocated to a well for production purposes. It recognizes that this could be attained either through adjustment of the present spacing unit (as proposed by Imperial, or under present regulation as proposed by Pan American and by British American) or, without change in the present spacing unit for drilling purposes, by the creation of larger spacing units for production purposes (as proposed by Hudson's Bay).

The shortcoming the Board sees in the Imperial proposal is that any productive well, wherever located in a pool, if it were drilled on one section spacing would presumably qualify for an allowable based on that area. The Board believes that this could upset the equitableness of distribution of production within a pool. In other words, it believes one section to be too large an area normally

to be considered fully productive by the drilling of only one well. On the other hand, there would seem to be no good reason why a well drilled on normal spacing, or other spacing authorized under the present regulations, should not be allocated additional contiguous area if there is satisfactory evidence that the area allocated is underlain by oil. It would seem that the direct way of permitting this would be to re-define the present dual purpose spacing unit as a "drilling spacing unit" and to define a new "production spacing unit" for production purposes only. This would require an amendment to the regulations and suggests an amendment to the Act.

The Board believes that a proper first principle for allocating area to a production spacing unit is that there be clear evidence of the presence of recoverable oil (practically recoverable from existing drilled wells) under the undrilled drilling spacing units to be added to the original drilled spacing unit. Favourable evidence of reservoir continuity as demonstrated by geological indications and by nearby drilled wells would be required. Only complete drilling spacing units of uniform ownership would be included in the well's production spacing unit. Tracts would be considered to have uniform ownership where the ownership of the lessor's interest is the same and ownership of the lessee's interest is the same or where all owners had agreed to pool. Validation rules would have to be developed.

Proponents of varying the spacing unit size regarded one section as a proper maximum. While the Board recognizes that in many instances this would be satisfactory, it believes there are other instances where a larger area would be justified. The Board believes that allocating up to a maximum of eight quarter section drilling spacing units symmetrically located about a drilled quarter section spacing unit would not be excessive in certain cases. Assuming necessary evidence for validation, the Board sees no reason for not allocating additional area on all sides of a drilling spacing unit rather than restricting it to two sides as is suggested in the case of quarter section spacing if the maximum size of the production spacing unit were to be one section. A reasonable upper limit for a production spacing unit in the Board's opinion would, therefore, be two and one quarter sections although a lower limit might be appropriate where drilling spacing units are smaller than a quarter section. The Board also considers that productive wells located within a maximum distance of one to two miles would be necessary for validation of intervening area.

Lease Allowables

(1) Views of Industry

Institution of a system of lease allowables was requested by Pan American, British American, Socony Mobil, Great Plains, IPAC, Texaco Exploration, Imperial and Texaco Canada. They

variously referred to the lease as "lease", "proration unit", "tract" or "production area".

The principal argument favouring adoption of lease allowables was the achievement of operating economies through cessation of operation of unnecessary wells. It was submitted that the resulting savings would be significant. It was generally acknowledged that lease allowables should be restricted to contiguous areas of the same ownership.

Pan American stated that it believed the lease should be fully productive as defined by geologic outline, but would not place any other limits on length, width or area. Imperial suggested maximum flexibility in allowable transfers with "the only limitation being the consent of relevant lessees and lessors". Similarly, Texaco Exploration suggested that lease-line well production rates above the pool average well allowable rate be determined by mutual agreement with the offset operators concerned. Restrictions on withdrawals from lease boundary wells in accordance with present practices were supported by Pan American, British American, Great Plains and IPAC.

Sun in final argument opposed the granting of lease allowables. It contended that unfair advantages, in allowable transfers and through the determination of gas-oil and water-oil ratios on a lease total basis, would accrue to large lease blocks.

Texaco Canada expressed the opinion that perhaps more detailed views of industry should be obtained in order to

establish a suitable set of rules for the granting of lease allowables.

Texaco Exploration and Great Plains urged the Board to proceed forthwith to develop a system of lease allowables to be instituted at the earliest opportunity.

(2) Views of the Board

There appears to be overlapping in the views expressed on the subject of variable or enlarged well spacing for production purposes and the subject of lease allowables. Discussion of variable well spacing seemed to be focused on new pools whereas discussion of lease allowables was focused more on old pools with excess productive capacity where wells unnecessary for pool depletion are still operated. The Board sees enlarged spacing for production purposes and lease allowables as separate matters.

On the one hand, it visualizes a production spacing unit containing one or more validated drilling spacing units with but one well producing. In new pools production spacing units would be established during development and wells would be drilled generally to satisfy productivity needs, pool delineation and competitive development. The Board believes that in old pools with excess productive capacity, enlarged production spacing units would be formed within the limits permitted and that surplus wells would be abandoned or suspended.

On the other hand, the Board sees a lease as containing a group of contiguous production spacing units each containing

one productive well and for which the well allowables might be totalled and assigned to the lease as a whole. In effect the Board sees leases being treated in a manner similar to units for distributing production within pools.

The Board expects that many of the objectives sought by industry through "lease allowables" would be met through the adoption of production spacing units. The Board recognizes however that there may be cases where lease allowables would still be desirable and where they would permit operating economies or better utilization of reservoir energy. Also the Board is satisfied that the advantages to be gained through lease allowables would be neither improper ones nor different than are now enjoyed by units.

The Board sees no need for limiting the size and shape of leases otherwise than by requiring contiguity and uniform ownership. Leases would be considered to have uniform ownership where the ownership of the lessor's interest was the same and the ownership of the lessee's interest was the same throughout the lease area or where all owners had agreed to pool their interests in the lease area. By the very nature of the lease allowable concept, and having in mind the definition of the production spacing unit, each of the wells contributing to the lease allowable would have to produce oil during each allowable period. Some arbitrary rule would have to be developed to fix the proportion of its allowable which would have to be produced by each well contributing to the allowable of the lease.

In addition the Board believes measures should be imposed to restrict production rates of lease boundary wells and to assure proper distribution of withdrawals for conservation purposes.

Having regard for the desirability of establishment of production spacing units and lease allowables, and the principles governing their establishment, the Board believes that it would be proper if the same rules were to apply to units under primary recovery operation. This would eliminate the present need for annual testing of most wells within units, although it would require monthly production from each well contributing to the allowable of the unit.

Enhanced Recovery Schemes

(1) Views of Industry

There was little discussion at the hearing of the manner of distributing allowables in pools being depleted simultaneously by primary and by enhanced recovery operations. A related matter, that of the manner of dealing with flooded out wells and injection and observation wells, was discussed to a limited degree. This discussion is reported in a later part of this section under the heading of "Wells Qualifying for Minimum Allowance".

(2) Views of the Board

For pools under primary drive only, whether containing units or not, the distribution of the pool allocation should be on the basis of the areas of the production

spacing units of the currently producing wells. As a well becomes unproductive it would cease to qualify for a share of the pool's allocation.

For pools wholly within a single unit, or wholly within a single lease and for which a lease allowable as above described is prescribed, there is no need for distribution of the pool allocation among the wells.

For pools wholly subject to enhanced recovery schemes, the Board believes that equitable distribution to the schemes would result if the distribution were on the basis of the sum of the areas of the production spacing units (at the time the first scheme becomes effective, subject to increase due to development) for each scheme times the respective recovery factors. The Board believes distribution on this basis is proper in view of the varying types of schemes that may be adopted and their effect on the abandonment of wells. No distribution within the individual schemes would be necessary. In these circumstances the share of the pool's allocation distributed to individual schemes would be unaffected by wells becoming unproductive except as it might be influenced by minimum allowances.

Pools subject to both primary and enhanced recovery operations pose a more difficult problem. The Board considers that since an enhanced recovery scheme may shorten the lives of certain wells over what would have prevailed under primary depletion it would be inequitable

to distribute the pool allocation on the basis of the currently productive production spacing units modified by the appropriate recovery factor. On the other hand, the Board also considers that it would be inequitable to retain unproductive production spacing units in the area of enhanced recovery schemes, without also doing so for the primary areas. To preserve a proper relationship between the two areas, the Board believes that the area attributed to primary recovery areas and the enhanced recovery schemes both should be fixed at the time when the first scheme is instituted, subject however, to increase due to future pool development. Hence, neither the area allocated to the primary recovery segment of a pool nor that allocated to the enhanced recovery segment of a pool would be reduced as production spacing units within either segment become unproductive. Thus, the pool allocation would be distributed first among the primary and enhanced recovery segments of the pool on the basis of the products of the respective areas and recovery factors. The share allocated to the primary area would then be distributed among the then remaining producing wells on the basis of the areas of their production spacing units. No distribution among wells would be necessary within the areas of enhanced recovery schemes. The area assigned to subsequent enhanced recovery schemes would be drawn from the area fixed for the pool at the time of the inception of the first enhanced recovery scheme, plus any increase due to development

since that time.

Wells Qualifying for Minimum Allowance

There were a number of views expressed on the subject of what wells should qualify for a minimum allowance. In many but not all cases the submissions made were with reference to the Board's terminal transfer policy.

(1) Views of Industry

Present Plan. Confining its submission to the present proration plan, Lewis Engineering, on behalf of Canada-Cities Service Petroleum Corp., Canadian Fina, Great Plains, Hudson's Bay, Marathon Oil Company, Socony Mobil, Pacific, Pan American and Western Decalta, recommended rescission of the Board's terminal transfer ruling. The effect of rescission of the ruling would be to continue indefinitely the assignment in enhanced recovery schemes of economic allowances to originally productive wells converted to injection service and the transfer of such allowances to remaining producing wells. Lewis Engineering considered the terminal transfer ruling inappropriate on several accounts: it contradicts the basic principle of the economic allowance, it leads to inconsistent treatment of wells not physically engaged in oil production, it encourages drilling of unnecessary wells and it does not encourage adoption of the most efficient enhanced recovery schemes. Lewis Engineering recommended granting full economic allowance allocation to all active and necessary

wells (producers and injectors) in pattern fluid injection schemes as long as these wells are contributing in any way to the recovery of oil. For line-drive and peripheral floods it proposed that the aggregate of economic allowances allocated for wells other than injectors be reduced in accordance with a prescribed schedule beginning at 50 per cent depletion of the ultimate reserves of the scheme and reaching a maximum reduction of one-half at 100 per cent depletion. Pan American proposed modifying this portion of the Lewis Engineering proposal so as to provide for no reduction in the aggregate of economic allowances allocated to line-drive and peripheral floods. Skelly supported the Lewis Engineering proposal, arguing, particularly with reference to primary depletion and partial pressure maintenance areas, that off-setting areas with few or no injectors have an allowable advantage through retaining a greater number of economic allowances for the same area.

Imperial submitted that terminal transfer was necessary with the economic allowances incorporated in the present plan and therefore opposed rescission of the ruling. Similarly, Triad opposed any consideration of the terminal transfer ruling on the ground that all the evidence had been thoroughly considered prior to institution of the ruling.

Proposed Plans. Under the respective new proration plans they advocated, Shell and Socony Mobil proposed

continuation of minimum allowances for all originally productive wells in pattern flood schemes in old and new pools. Canadian Fina also favoured continuation of minimum allowances for such wells. Pan American made a similar proposal but would limit its application to old pools. Texaco Canada recommended that minimum allowances be assigned to production and injection wells and that these allowances not be subject to terminal transfer. Hudson's Bay, in advocating an acreage-depth minimum allowance without reference to specific wells, implied indefinite minimum allowance assignment through the area allocated to a well, unit, or project. In their submissions, IPAC and Great Plains proposed reduction of the aggregate of minimum allowances for leases or enhanced recovery areas on the basis of a relationship similar to that suggested by Lewis Engineering in reference to the present plan. The reductions as proposed in both submissions would commence soon after initial production of the lease or scheme but are nominal in early stages of pool depletion, thereafter declining more rapidly to a maximum reduction of 60 per cent at abandonment.

(2) Views of the Board

Dealing first with the question of wells qualifying for minimum allowances under the new plan, the Board is now convinced that only producing wells should qualify for any allowable, minimum or otherwise. The Board believes that the former justification of the transfer of minimum allowances of non-producing wells to other wells in enhanced

recovery schemes and units will be wholly removed upon the full implementation of the new plan - with its revised minimum allowance objectives and the increased and proportionate weight given both to allocated area and to recovery factor. Consideration, however, must be given to the qualification for allowables of injection wells, observation wells and capable non-produced wells in units, during the transition period.

The Board remains convinced that the terminal transfer policy is a proper one under the present proration plan. In view, however, of the characteristics of the new plan under which the terminal transfer question no longer arises, and of arrangements to be made during the transition period as discussed here and in Section IX, the Board has decided to rescind the ruling effective April 30, 1968, and to extend to April 30, 1965, the time before the ruling will become effective for schemes in operation prior to September 12, 1961. The Board anticipates that under the ruling as so amended many enhanced recovery schemes will lose the benefit of transfer of economic allowances effective April 30, 1965. The Board intends, however, to review all schemes and where it appears that under the ruling they would have had the benefit of transfer of economic allowances for a period significantly beyond April 30, 1965, to extend the period of transfer in its best judgment to a date not later than April 30, 1968.

From May 1, 1968, only producing wells will qualify for an allowable, minimum or otherwise.

Target Area Regulations

(1) Introduction

The present system of well spacing regulation provides

for location of the well bore within a specific target area in the productive zone. The standard target area for oil wells is square with a side dimension of 660 feet and with its centre in the centre of the prescribed legal subdivision in each spacing unit. Standard target areas for wells drilled on quarter section spacing are in the south-west legal subdivision of the quarter section. A system of area factors applies for wells completed in other than the prescribed target area, reducing their allowables. These regulations are designed for the protection of correlative rights and the furthering of uniform drainage patterns in a pool.

(2) Views of Industry

Pan American envisioned flexible target area requirements complementary to varying sizes and shapes of spacing units. British American favoured greater flexibility than presently permitted but implied that limits on lease boundary target areas would have to be retained.

Hudson's Bay suggested no limit be imposed on the number of wells to be completed within a (production) spacing unit. Original wells drilled to validate the spacing unit would be subject to target area regulations, whereas infill wells drilled subsequent to validation need not conform with established pattern location requirements.

Imperial and IPAC advocated retention of present target area regulations. Great Plains advocated, and

Shell appeared to favour, retention of the existing spacing regulations, from which the Board assumes that they believe the present target area regulations should be retained.

(3) Views of the Board

The Board sees a continuing need for designating a target area within a legal subdivision and believes that the present target area offers adequate flexibility for well location. After some experience with the production spacing unit concept, the Board may wish to review the details of the target area regulations. The Board's present view is that the reduced target area factor should continue to apply to an off-target well in a drilling spacing unit, but additional drilling spacing units included in the well's production spacing unit would not be subject to the reduced area factor. The operator could apply as is the case today for relief from application of the reduced area factor.

Restrictions on Maximum Daily Rates of Production
on the Basis of GOR, WOR or Lease Boundary Location

(1) Introduction

A maximum permissive daily rate of withdrawal is currently imposed as a conservation measure to prevent reservoir damage, waste of reservoir energy and consequent losses in ultimate recovery. Maximum daily rates of withdrawal are determined in accordance with the MPR formula or through the pool MER in those cases where this is established. For primary recovery areas, individual

well maximum daily rates apply. For units or projects, a single maximum daily rate is employed, being the aggregate of the individual well maximum daily rates of wells within the unit or project but restrictions on average daily well withdrawal rates are imposed on boundary wells to protect the interests of owners of offsetting wells.

In primary non-unit areas, average daily allowables of individual wells are subject to reduction in accordance with an appropriate penalty schedule where excessive reservoir voidage would otherwise ensue on account of excess production of gas or water with the crude oil allowable. This form of restriction tends to dampen those reservoir drawdown effects which are adverse to conservation. In units and enhanced recovery projects, gas-oil ratio and water-oil ratio penalties apply on a total allowable basis, but restrictions may be imposed on withdrawals from individual wells to prevent excess gas or water production.

(2) Views of Industry

Most companies were in favour of some regulatory limitation on maximum rates of production and the continuance of gas-oil and water-oil ratio penalties in some situations. There was, however, discussion concerning the basis of establishment of maximum rates.

Pan American requested that the present MPR formula no longer be used to establish maximum rates of withdrawal, and advocated, as an alternative, that maximum "safe"

rates be established, having regard to the reservoir characteristics of each pool. Hudson's Bay expressed a similar opinion. Socony Mobil proposed that existing MER's and MPR's be continued as maximum production rates, but submitted further that this matter be considered at a public hearing. Shell considered the present MPR and MER system was a fairly satisfactory basis for determining maximum rates.

British American suggested the pool allocation be limited by the pool MER in the interests of conservation. IPAC also recognized the need for setting maximum pool withdrawal rates, but questioned the suitability of existing MPR's and MER's for this purpose. It submitted that present gas and water penalties served to limit well withdrawals satisfactorily, having regard to conservation and correlative rights, and it therefore did not believe that maximum daily rates need be established for other than lease-line wells, a view endorsed by Texaco Canada. Great Plains also took a similar position, contending that limitations on maximum rates are unnecessary unless such limitations are required to avoid reservoir damage, and that gas and water penalties would serve to protect correlative rights and conserve reservoir energy. Furthermore, Great Plains contended that penalties should be waived when lease-line equity and conservation are not affected. Hudson's Bay, Imperial, Shell and Pacific favoured continuation of gas-oil and water-oil ratio penalties, but

not necessarily as a substitute for maximum withdrawal rate restrictions.

Restrictions on lease-line wells should only be required, Pan American advocated, to protect correlative rights. Imperial and Texaco Exploration proposed that lease-line restrictions be determined by negotiations between the various interest owners affected. Hudson's Bay suggested that compensatory drainage effects would obviate the need for lease boundary restrictions in many cases, and favoured, in general, as much flexibility as could reasonably be justified.

Imperial in discussing operating procedures to prevent premature abandonment suggested that where average daily well allowables are reduced by regulations to below, say 10 barrels per day, the operator be permitted to carry forward allowables for lengthy time periods and operate intermittently.

(3) Views of the Board

The Board agrees with those in industry who believe that some form of maximum rate restrictions for wells, leases, projects and pools as a whole should be retained in the interests of preventing reservoir waste. Furthermore, in the Board's view, gas-oil ratio and water-oil ratio penalties serve the dual purposes of furtherance of conservation and protection of the interests of other owners. The Board believes that maximum rate restrictions and gas and water penalty restrictions complement one

another and that there is no sound reason for discarding either.

The Board agrees that the present MPR formula is not a fully satisfactory basis for determining maximum rates and intends to review at a public hearing in the near future alternate methods of establishing maximum rates. Also the Board believes there may be certain minor inconsistencies in its gas-oil ratio penalty tables and intends to review this matter at the same hearing.

The suggestion of carrying forward allowables for lengthy time periods for wells where regulatory restrictions have reduced the average daily allowable to a marginal level is viewed favourably by the Board. Where better conservation and better economics can be achieved, as for example where winter operations would coincide with peak gas requirements on high GOR wells or where summer operations are more desirable to permit easier handling of produced water, annual allowables could be granted. If the Board receives a specific request of this kind it will give consideration to it.

With respect to boundary wells in leases and units the Board feels that the present policy which provides for removal of rate restrictions with the mutual consent of the well owners affected satisfactorily meets the aims of all concerned and consequently should be retained.

Redistribution of Allowable not Produced
by Wells, Leases or Enhanced Recovery Projects

(1) Introduction

In carrying out the details of the distribution of a pool's allocation within the pool, account must be taken of the physical incapacibilities of certain wells and of previously mentioned regulatory restrictions which preclude a well, lease or project from producing the allowable that would otherwise be assigned to it. For convenience the allowable which would be assigned in the absence of physical incapability or other restrictions will be called the gross allowable.

As depletion of individual wells, lease or projects progresses, productive capacity may and ordinarily does decline until a stage is reached where the well, lease or project is incapable of meeting its gross allowable. Redistribution to other wells, leases or projects of that portion of the allowable not produced becomes necessary.

Regulatory restrictions in the form of maximum daily rates, target area factors and penalties for excessive gas or water production may be imposed. The failure of a well, lease or project to meet its gross allowable on account of any of these regulatory restrictions also leads to a need for redistribution similar to the case where physical incapability exists.

(2) Views of Industry

Great Plains, viewing gas and water penalties primarily

as a means of sustaining equitable withdrawals within pools advocated that the difference between the gross allowable and actual production be redistributed among the remaining capable wells within the pool affected. Any incapability remaining after redistribution within the pool would be re-allocated among the remaining pools in the Province.

Hudson's Bay, Imperial, IPAC, Shell, Texaco Canada and Texaco Exploration favoured a procedure which would involve redistribution to all eligible pools of differences between gross allowables and expected production of individual wells, leases or schemes. In general it seemed to be implied that, since even under Great Plains' proposal eventual lack of production capability in a pool would require reallocation to other pools, it would be consistent therefore to re-allocate among all eligible pools starting at the first occurrence of the differences between gross allowable and expected production in a pool.

(3) Views of Board

The Board agrees with Great Plains that it is proper to redistribute to other wells, leases and projects within the pool affected, to the extent that it would be producible, that portion of the gross allowable of a well, unit or scheme not producible either on account of lack of physical ability or regulatory restriction. For pools subject to enhanced recovery and primary operations the initial distribution would be within the respective segments of

the pool affected. The Board recognizes that under this procedure, when a pool as a whole becomes incapable of or is restricted from producing its allocation, the portion of the pool's allocation which cannot be produced must necessarily be re-allocated among other pools in the Province. The Board is satisfied that such a procedure, taken in total, would yield results which would be reasonable among pools and equitable within pools.

Special Problems

Certain simple procedures are required to accommodate particular situations under the new proration plan. Among these are procedures for establishing the reserves of discovery wells, new pools, new enhanced recovery schemes and pools undergoing considerable development between review dates.

1. Discovery Wells and Groups of Wells Outside Designated Pools

(1) Views of Industry

California Standard proposed a discovery bonus allowance ranging from 14 barrels per day for wells completed at 3,000 feet to 125 barrels per day for discovery wells completed at 15,000 feet. It submitted that a discovery bonus allowance is desirable to "adequately pay out the discovery well and compensate the operator for deeper exploratory drilling". The discovery bonus also would be granted to two follow-up wells. California Standard assumed that sufficient structural and economic information

would be available after completion of three wells in a pool to determine the economics of continued development.

Dome advocated adoption of a "discovery bonus" as an incentive to explore for new oil pools and extend existing pools. Dome would award a discovery bonus to the discovery well of a new pool or a well revealing a 4-mile extension to an existing pool. The discovery bonus would be awarded by granting up to 1,280 acres to a discovery well using the IPAC proration plan or, under the terms of the present proration plan the operator of the discovery well would be permitted to produce the discovery well and three follow-up wells for twelve months at the well MPR level within a five-year period of discovery.

Texaco Canada proposed in connection with its proration plan that reserves for a discovery well in any area initially be determined on the basis of 640 acres assigned to the well.

Pan American in testimony suggested assigning additional area up to a maximum of 640 acres to the discovery well of a low reserve per acre pool as a means of obtaining a sufficient reserve allocation to obtain an allowable rate which would be economic within its plan of proration. In reply to a question it indicated that no well capable of economic rates of production should be rendered uneconomic to produce by the assignment of an inadequate allowable.

Imperial suggested in its response that variable density spacing is the answer to discovery bonuses. It contended that most discoveries would be economic to produce on 640-acre spacing with the allowables such well would be allocated on the modified ultimate reserves proration base it proposed.

(2) Views of the Board

The Board sees no fundamental basis for treating a discovery well other than as a one well pool for which an arbitrary area must be assigned. It believes that the well should receive an allowable equal to the greater of the applicable minimum allowance or its calculated share of the provincial allowable based upon the area of its drilling spacing unit and the best available information on the reservoir properties. Similarly the Board believes that groups of wells not yet declared a pool should be treated as they would be if they were in a designated pool except that consideration of the reservoir factors would not be done at a public hearing.

2. Newly Designated Pools and Pools under Active Development

Usually as development of a newly discovered pool progresses, a sufficient number of productive wells is eventually completed to warrant formal field and pool designation. Such fields and pools will usually be designated between the annual reserve hearings. The Board plans that newly designated pools will be assigned

reserves established by the Board staff following discussions with the operators of wells in the pools.

For pools under active development the pool reserve utilized in establishing the portion of the provincial allowable to be allocated to the pool normally will be altered from month to month on the basis of the estimated number of wells capable of production at the middle of the allowable month, the validated acreage and the average reserve per acre previously established for the pool. New wells completed in a pool during a month will be produced at the daily allowable rate per acre prescribed for the month for wells in the pool.

Where, in the opinion of the Board, as the result of pool development there is evidence suggesting a significant change in the reserves per acre for the pool, the Board may amend without a public hearing the reserves per acre figure pending the next public hearing.

3. New Enhanced Recovery Schemes

An enhanced recovery scheme authorized and put into full operation between the annual reserve reviews will be assigned a recovery factor representing the Board's best estimate of the recovery efficiency for the remaining part of the year. Thereafter the factor would be subject to review at the annual reserve hearing.

IX TRANSITION - IMPLEMENTATION

The notice of hearing invited representations concerning the method of introduction of, and the transition to, any new or revised plan for the allocation to pools and wells of the provincial allowable. In similar letters, dated January 18, 1963, to the Canadian Petroleum Association and to the Independent Petroleum Association of Canada, the Board had stated that, if as a result of the proposed hearing, changes were made in the plan, they would be introduced in such a way that serious immediate changes in allowables of existing wells would not be caused.

Most of the submissions to the Board contained recommendations regarding a transition period, each of which would apply to its own particular scheme. As there was little examination of these recommendations at the hearing, the Board has been somewhat cautious in interpreting industry's general reaction to each transition proposal.

In the main, the transition proposals submitted by industry did not distinguish significantly between among and within pool allocation, but rather treated the transition as applying to the proration system as a whole. The Board, therefore, in summarizing the views of industry has not found it appropriate to preserve the distinction observed in preceding sections of this report regarding among and within pool allocation.

Views of Industry

Almost all of those making submissions agreed as a general principle that if any significant changes to the present proration plan were to be made, they should be implemented after a suitable transition period for old pools to prevent any undue hardships for the individual operators. In other words, the transition period should be related to the normal well pay-out period, or slightly longer, to ensure that investments made under the present system would not be seriously affected.

The periods of transition proposed fell between two limits. Great Plains and Hudson's Bay recommended that the transition be over a six-year period, while at the other limit, California Standard suggested that the new plan it proposed should be fully effective after a two-year transition period for old and new pools alike.

The remainder of the recommendations included such periods as three years by Imperial and Texaco Canada and supported by Skelly, four years by IPAC and Texaco Exploration and five years by Pan American, Shell, Socony Mobil, Sun and supported by Amerada and Pacific. The periods in these recommendations are not all strictly comparable as there is a variation in the starting dates of the transition periods proposed. In addition, some of these companies proposed a gradual transition system and others proposed an abrupt change after a suitable waiting period.

Great Plains argued that since the present system allows for seven years of initial economic allowance the transition period should provide an opportunity for an operator drilling a well in a recently discovered pool under the present plan to recover his investment. It thus advocated the present plan be unaltered for six years. Pan American, Socony Mobil, Texaco Canada and Texaco Exploration contended in their responses that six years was an excessive deferment for the initiation of a new plan which would presumably contain many advantages over the old plan. They argued that the transition period should be related to the normal well pay-out period, or slightly longer, to ensure that investments made under the present plan would not be seriously affected and that a normal well pay-out period under today's conditions would be in the order of three to five years.

Significant differences of opinion existed concerning whether the change from the old plan to the new plan should be abrupt or gradual. Great Plains, Imperial, Texaco Canada, Texaco Exploration, Skelly and IPAC recommended that an abrupt change be made from the old to the new plan after a suitable waiting period, although there was disagreement as to whether this would apply to both old and new pools during the transition period.

Imperial recommended that during the transition period the shares of the provincial allowable to the group of old pools and to the group of new pools would be determined in proportion

to its proposed final formula, ultimate reserves modified by a mobility factor. The share of the provincial allowable allocated to the group of new pools would then be allocated among and within pools by its proposed proration plan, but the share of the provincial allowable allocated to the group of old pools would be allocated among and within pools on the basis of the present system until January 1, 1967. Thereafter its proposed new system would apply to all pools. Texaco Exploration's recommendation was similar to that of Imperial except that it advocated a conversion date for old pools of January 1, 1968. Texaco Canada, supported by Skelly, also proposed that its new proration system apply immediately to new pools and after three years to old pools, but it did not offer any details as to how the provincial allowable would be allocated between old and new pools during the transition period.

IPAC and Great Plains recommended that old and new pools be treated alike during the transition period. IPAC proposed that the provincial allowable be allocated on the present basis until January 1, 1968, after which its proposed system would be implemented in both old and new pools. It was argued by IPAC that it would be better to have an abrupt change after a suitable waiting period, as the predicted increase in the demand would make the impact of any such changes less at that time. Great Plains' recommendation differed only in its date of conversion to the new system of January 1, 1970.

The advocates of change within the transition period itself, as opposed to an abrupt change at the end of transition, included British American, California Standard, Hudson's Bay, Pan American, Shell, Socony Mobil, Sun, Pacific and Amerada. Pan American, Shell and Socony Mobil proposed similar methods, recommending that during the transition period the total provincial allowable be divided between the total of old pools and the total of new pools principally by the proportion of remaining or ultimate reserves, as the case may be, in each category. That portion of the provincial allowable allocated to new pools would be distributed among and within such pools in accordance with the respective plans proposed for use after the transition period. The portion of demand allocated to old pools would be distributed among and within pools by both the present and proposed plans, weighted in accordance with the following schedule:

	<u>Present Plan</u>	<u>Proposed Plan</u>
1965	80%	20%
1966	60%	40%
1967	40%	60%
1968	20%	80%

By 1969 the proposed formula would apply to all pools.

British American and Hudson's Bay also proposed a transition method similar to that outlined above. British American, however, did not specify in its submission how the provincial allowable would be initially divided between old

and new pools during the transition period, while Hudson's Bay recommended that, in 1965, 100 per cent rather than 80 per cent of the demand allocated to old pools would be distributed by the present plan, which would mean its proposed plan would not apply to all pools until 1970.

California Standard and Sun recommended that old and new pools be treated alike during the transition period. California Standard proposed that the transition period be two years, with a rate of change of 33 1/3 per cent per year from the present system to its new system. Sun proposed that the basic allowance be changed to a floor allowance on January 1, 1965, and that the final floor allowance have values equivalent to 50 per cent of the applicable initial or operating economic allowance. Sun suggested this should be done over a five-year transition period changing at 10 per cent per year until in 1969 the new system would be in effect.

British American, Imperial, Pan American, Shell, Texaco Canada and Texaco Exploration testified upon cross-examination that they would not favour continuing the old proration system indefinitely for old pools and only applying a new proration plan to new pools.

Several companies who advocated the adoption within pools of a system of "lease" or "tract" allowables proposed that this aspect of their scheme be implemented immediately.

Views of the Board

As previously stated by the Board in letters to industry,

and as agreed to in general by most of those making submissions, the transition from the present to the new system should be designed to avoid serious immediate changes in allowables of existing wells. Furthermore, the Board believes the transition from current pool allocations to those which will prevail under the new plan should be reasonably smooth, an objective which appears to have been adopted in many submissions.

The Board agrees with the majority of those appearing at the hearing, that a transition period of four to five years is proper.

Consideration was given to the suggestion made in several submissions that different proration systems be used for old and new pools during the transition period. The Board is concerned about the provision in the statute which requires allocation among pools in a reasonable manner and is not satisfied that the simultaneous use of two different systems for allocation among pools would adequately meet the test of reasonability. In addition it is evident that any plan involving two different prorating systems would be more complicated to administer.

1. Allocation among Pools

In view of certain unsatisfactory features of the present plan, particularly as they relate to the development of new pools, and in the interests of simplicity, the Board believes that it would be desirable to convert to the new plan on May 1, 1965, for allocation among pools. However, to avoid an

undesirable impact on certain pools and to provide a relatively smooth transition, it would be necessary to retain certain features of the existing plan for at least part of the transition period. The Board believes it would be necessary to continue the present basic economic allowance for most of the period and to defer adoption of the new floor allowance until the end of the period. Also, to simulate the present residual MPR system, it would be necessary to modify the new plan to incorporate a "residual reserves" concept for most of the transition period.

If these modifications are made to the new proration plan during the transition period, the reserves system adopted by the Board in the new plan could be implemented almost immediately. This approach would have the significant advantage of eliminating the present MPR from all proration calculations. On the other hand it has the disadvantage of requiring selection of suitable "residual reserves" figures, a matter which the Board recognizes must be arbitrary. The Board has examined several alternatives, utilizing the present Board forecasts of market demand and reserves of light and medium crude oil, to ascertain the impact of each and thus to determine which would most closely accord with the transition objectives.

The method adopted by the Board for determining a suitable "residual reserve" for the transition period is to divide the

subsisting pool economic allowance by a representative allocation factor,⁽¹⁾ based on that which the Board estimates would prevail over the period concerned were the new plan for allocation among pools fully implemented. The allocation factor employed by the Board in computing the "economic reserves" was 0.00011. The Board determined by trial that the use of an "economic reserve" taken as 75 per cent of the quantity determined above best satisfied its transition objectives. The deduction of this "economic reserve" from a pool's ultimate reserve less half its cumulative production establishes a pool's "residual reserve".

For most of the transition period then, the pool allocation will comprise its present initial or operating economic allowance, as applicable, and a share of the residual provincial allowable proportional to the ratio of its "residual reserves" to the sum of the "residual reserves" for all the pools of the Province. As in the present plan, the residual provincial allowable is the total provincial allowable less the provincial economic allowance.

The Board has decided to retain the present plan until April 30, 1965. The "residual reserves" method of allocating among pools will be employed for the three-year period,

(1) Allocation factor here means the ratio of the provincial allowable to the provincial ultimate reserves less one-half of the cumulative provincial production.

May 1, 1965, to April 30, 1968. For the year May 1, 1968, to April 30, 1969, the basic allowance and "residual reserves" features of pool allocation will be discontinued, and the pool will receive the pool operating economic allowance or its allocation on the basis of ultimate reserves less one-half cumulative production, whichever be greater. On May 1, 1969, the new plan will be fully implemented.

2. Distribution within Pools

The Board intends to implement the system of distribution within pools discussed in Section VIII in modified form on May 1, 1965, and fully with the new minimum allowance, effective May 1, 1969. The modifications are designed to satisfy the objective adopted by the Board of avoiding serious immediate changes in allowables of existing wells.

The present scheme will be continued until April 30, 1965. From May 1, 1965, to April 30, 1968, each well will receive the applicable initial or operating economic allowance and a share of the residual allocation to a pool based on the area method modified by recovery factor described in Section VIII. Since the Board has also decided that only producing wells should qualify for an allowable, the present assignment of minimum allowances to injection, observation and certain other non-producing wells will be discontinued commencing in the transition period.

For injection wells this policy will be effective May 1, 1965, or such later date not beyond April 30, 1968, as

may be determined by the Board as discussed in Section VIII. The Board considers that industry has had adequate notice of the Board's conviction that injection wells should not indefinitely qualify for minimum allowances. In any case enhanced recovery schemes during the transition period, will receive direct benefit for total area and the enhanced recovery in their share of the residual demand and, effective May 1, 1968, will receive total allowables virtually proportionate to area and recovery.

For those wells capable of production but shut in for observation services or because of surplus productivity in a unit, the Board, recognizing that industry has not received advance notice will not implement the policy until May 1, 1968. For the three-year period, May 1, 1965, to April 30, 1968, therefore, minimum allowances equal to the lesser of the subsisting economic allowance or the physical productivity will continue to be assigned to capable wells shut in for observation service or because of surplus productivity. To minimize the amount of well testing required the Board will establish fixed minimum allowances for the three-year period where estimates of average productivity over the three-year period satisfactory to the Board are provided. From May 1, 1969, units in which such wells exist will receive under the new plan total allowables virtually proportionate to the combined area of their production spacing units and their recovery.

The Board wishes to permit the operating economies which may be obtained through the formation of production spacing units, as outlined in Section VIII, to be obtained at the earliest possible date. It realizes that the incentives to form production spacing units will be reduced if, in accordance with the new policy regarding the qualification of wells for allowables, the economic allowance assigned to certain wells included in the production spacing unit is discontinued. It is therefore prepared, on application, to assign until April 30, 1968, to the well in a production spacing unit a basic allowance equal to the sum of the lesser of the basic allowance or the estimated average productivity over the three-year period, May 1, 1965, to April 30, 1968, of each of the wells whose drilling spacing units contribute to the area of the production spacing unit. Where there is a question of productivity, the Board will require an operator to submit satisfactory estimates of average well productivity in support of such an application.

For the year May 1, 1968, to April 30, 1969, the Board will fully implement the new method of distribution within pools, with the exception that the present operating economic allowance, rather than the new minimum allowance, will be utilized. From May 1, 1969, the new plan, incorporating the new minimum allowance, will be effective.

3. Reconsideration

With respect to the level of well allowables, and to

the qualification for and transferability of minimum allowances, it is difficult for the Board to foresee all of the detailed consequences during the transition period of its decisions. If the Board's intent of providing a fair and reasonable transition from the present plan to the new plan is not adequately satisfied in any particular case, the Board, on application, will reconsider the case and may give it special transition treatment.

X SUMMARY AND DETAILS OF THE NEW
ALBERTA PRORATION PLAN

The Board and its staff have given detailed consideration to the evidence and opinions presented at the hearing held during November, 1963, for the purpose of reviewing the present Board plan for proration to market demand. The Board has concluded that the present plan has serious deficiencies and must be replaced by a new plan following an appropriate transition period. Details of the views of industry and of the Board are provided in Sections I to IX of this report. Particulars of the new plan are summarized below.

Scope of Plan

The Board will continue prorating only light and medium crude oil. Production from Turner Valley and other pools discovered prior to 1947 will continue to be regulated as at present, but outside the proration plan. However, production from small oil accumulations in gas fields, and discovery wells and undesignated pools will be prorated in the same manner as that from designated pools.

Having regard both to conservation considerations and to the expected modest impact of condensate and pentanes plus production from gas processing plants and cycling plants on the market for light and medium crude oil, such production will remain unprorated. The Board believes, however, that future cycling plants should be sized having regard not only to conservation considerations but also to the impact of

their production on the crude oil market. Should condensate and pentanes plus production increase in the future more rapidly than expected, the Board may reconsider this decision as it applies to production from cycling plants.

The Board does not consider the proration of black or heavy crude oil to be either necessary or desirable at this time. If large reserves of heavy crude oil are developed and especially if the oil should become interchangeable in the market with light and medium crude oil it may become necessary in the future to include this category of production in the proration plan.

The Board will consider applications for the exclusion from the proration plan of the production from pools subject to approved concurrent gas cap and oil zone depletion and from oil pools in advanced stages of depletion. Each application will be considered having regard to conservation effects and the impact of granting the application on the provincial allowable for prorated crude oil.

Provincial Allowable

The provincial allowable will continue to be determined as at present following monthly Board hearings to receive the purchasers' nominations on which the market demand is determined.

Minimum Allowances

The Board remains convinced of the need for a minimum

allowance but its concept of the purpose of the minimum allowance has significantly changed as a result of its own experience and the views expressed at the hearing. The Board now believes the minimum allowance to be necessary in both old and new pools only to avoid premature abandonment of wells and to permit the completion and operation of wells drilled to low reserve per acre pools. Accordingly the minimum allowance should be large enough, but no larger than necessary, to permit the recovery of completion and operating costs and to give a satisfactory return on the former. The minimum allowance under the new plan will be a floor allowance, scaled with depth, and, applying only to producing wells, will not be transferable.

A segregated multi-zone well, when the new minimum allowance becomes effective, will receive for each of its zones the minimum allowance for a single completion in that zone.

The schedule of minimum allowances is shown in Table 2. The new minimum allowance will be effective May 1, 1969.

Allocation among Pools

Of the two main bases for allocation among pools proposed at the hearing, ultimate and remaining reserves, the Board finds each to contain certain advantages and disadvantages. The Board has decided that a composite pool allocation base, with an equal weighting of ultimate and remaining reserves would best reflect the advantages and minimize the disadvantages associated with each. The use of 50 per cent of a pool's ultimate reserves and 50 per cent of its remaining reserves as the pool allocation base is mathematically equivalent to using

Table 2

TABULATION OF MINIMUM ALLOWANCES
Effective May 1, 1969

<u>Depth Interval (feet)</u>	<u>Barrels per day</u>	<u>Depth Interval (feet)</u>	<u>Barrels per day</u>
0 - 2400	10	11,001 - 11,250	31
2401 - 3100	11	11,251 - 11,500	32
3101 - 3800	12	11,501 - 11,750	33
3801 - 4400	13	11,751 - 12,000	34
4401 - 5000	14	12,001 - 12,250	35
5001 - 5500	15	12,251 - 12,450	36
5501 - 6000	16	12,451 - 12,650	37
6001 - 6500	17	12,651 - 12,850	38
6501 - 6950	18	12,851 - 13,050	39
6951 - 7400	19	13,051 - 13,250	40
7401 - 7800	20	13,251 - 13,450	41
7801 - 8200	21	13,451 - 13,650	42
8201 - 8550	22	13,651 - 13,850	43
8551 - 8900	23	13,851 - 14,050	44
8901 - 9250	24	14,051 - 14,250	45
9251 - 9550	25	14,251 - 14,400	46
9551 - 9850	26	14,401 - 14,550	47
9851 - 10,150	27	14,551 - 14,700	48
10,151 - 10,450	28	14,701 - 14,850	49
10,451 - 10,750	29	14,841 - 15,000	50
10,751 - 11,000	30		

the pool's ultimate reserves less 50 per cent of its cumulative production.

The plan will be implemented in modified form for transition purposes May 1, 1965, and fully implemented with the new minimum allowance May 1, 1969. Public hearings will be held during February of each year commencing in 1965 to determine the ultimate reserves of each pool. Additions to a pool's cumulative production, and hence adjustment to the pool's allocation base, will also be made annually. Both ultimate reserves and production will be assessed as of December 31 of the preceding year.

Production from small oil accumulations in gas fields, discovery wells and undesignated pools will be prorated in the same manner as that from designated pools, subject however to the retention to April 30, 1968, of the present special minimum allowance of 50 barrels per day. In cases of discovery wells and pools first designated between Board hearings, the allocation will be based on an initial average reserve per acre set by the Board staff in consultation with the operators involved.

The ultimate reserve for a pool undergoing significant development will be altered from month to month without public hearing to allow for newly completed wells and changes in validated area. Significant adjustments in reserves attributable to new data, the initiation or alteration of enhanced recovery schemes, or the redesignation of pools, will be made at any time at the discretion of the Board.

Distribution within Pools

Of the methods proposed at the hearing, ultimate reserves and area in various modifications, the Board believes that all things considered, the area method, modified for recovery factor is the most satisfactory method for distributing the pool allocation. The recovery factor modifier will be based on the presumption of pool average physical properties. The Board has decided to implement this method in modified form for transition purposes effective May 1, 1965, and fully with the new minimum allowance effective May 1, 1969.

Particulars of the application of the plan when fully implemented are as follows:

1. Pools not containing enhanced recovery schemes, whether containing units or not.

Subject to the effect of the minimum allowance, the pool allocation will be divided among the producing wells in the pool on the basis of the areas of the production spacing units of the currently producing wells. The production spacing unit is described later in this Section. If the well in a production spacing unit, other than in a unit, is unable to produce a portion of its allowable that portion is redistributed to the remaining wells in the pool. If a unit is unable to produce a portion of its allowable that portion is redistributed

to the remaining wells in the pool. If the pool as a whole cannot produce its allocation then that portion which it is unable to produce is reallocated to other capable pools in the Province.

2. Pools wholly under a single unit or a single enhanced recovery scheme.

No distribution among wells is necessary because of the single ownership or its equivalent. If the pool is unable to produce its allocation the portion which it is unable to produce is reallocated to other capable pools in the Province.

3. Pools in which one or more enhanced recovery schemes are in operation, whether containing units or not.

Where the entire pool is under enhanced recovery schemes the pool allocation is distributed, subject to the effect of the minimum allowance, among the schemes on the basis of the sum of the areas of the production spacing units productive at the time of inception of the first scheme, subject to increase due to development, modified by the applicable recovery factors.

Where the pool is under enhanced recovery schemes and primary, unit or non-unit operations the pool allocation is distributed, subject to the effect of the minimum allowance, to each of the schemes and primary areas on the basis of the sum of the areas of all their respective production spacing

units productive at the time of inception of the first scheme in the pool, subject to increase due to development, modified in the case of the schemes by the appropriate recovery factors.

No distribution among the wells in a unit or enhanced recovery scheme area is necessary. The distribution among wells in a primary non-unit area is as described under heading 1 above. Where a unit, scheme or primary area is unable to produce a portion of its allowable the portion it is unable to produce is reallocated to the remainder of the pool. Where the pool is unable to produce a portion of its allocation the portion is reallocated to other capable pools in the Province.

It should be noted that in each of the above cases when the plan is fully implemented only wells which produce oil receive an allowable. Further, the allowable allocated to an enhanced recovery scheme, whether unitized or not, so long as the scheme as a whole has adequate productivity, is not reduced through lack of productivity or abandonment of individual wells.

Area Allocated to Wells

The Board plans to seek redefinition of the present dual purpose spacing unit as a "drilling spacing unit" and definition of a new "production spacing unit" for production

purposes only. This will require amendments to the regulations and amendments to the Act are desirable.

The drilling spacing unit will be defined as at present but with deletion of reference to the purpose of producing oil or gas.

The production spacing unit will be for production purposes only. Its area will be the area of the drilling spacing unit of a producing well and, when validated and approved, additional contiguous area, in the form of complete drilling spacing units. Detailed validation rules will be developed and will include as principal rules the following:

(1) The drilling spacing units included in a production spacing unit must be of common ownership or the equivalent.

(2) Any drilling spacing units included in a production spacing unit must be situated more or less directly between productive wells separated by not more than one to two miles.

(3) There must be adequate geological and other evidence that the drilling spacing units included are underlain by oil practically recoverable from the well in the production spacing unit.

(4) The maximum area of a production spacing unit will be two and one-quarter sections subject to possible reduction where wells are drilled on less than quarter section spacing.

The production spacing units will be determined on application to and approval of the Board. The Board intends that the concept of production spacing units will be effective

May 1, 1965.

Lease Allowables

While the Board believes that the concept of production spacing units meets most of the objectives sought by industry through lease allowables, it agrees that there may be cases where lease allowables would be advantageous and therefore adopts the lease allowable concept. Rules will be developed to prescribe the circumstances under which leases will qualify for lease allowables and the restrictions to which they would be subject.

The principal rules which among others will apply to lease allowables are the following:

- (1) A qualifying lease will consist of contiguous production spacing units of common ownership or the equivalent.
- (2) The well in each production spacing unit in the lease must produce a certain minimum amount of oil in each allowable period.
- (3) Lease boundary wells will be subject to gas-oil ratio, water-oil ratio and maximum daily allowable restrictions.
- (4) Subject to (3) above, the gas-oil ratio and water-oil ratio penalties shall be computed as though the entire production from the lease was produced from a single well.

Leases qualifying for lease allowables will be determined on application to and approval of the Board. The Board intends

that the concept of lease allowables will be effective May 1, 1965.

Target Area Regulations

The Board believes its present target area regulations requiring completion of wells within designated areas of designated legal subdivisions are satisfactory and these will be continued.

Allocation of Minimum Allowances to Non-Producing Wells

The Board believes that the former justification for the allocation of minimum allowances to non-producing wells in enhanced recovery schemes and units and for the transfer of such allowances to producing wells will be removed. Removal will be largely accomplished when the basic allowance is replaced by the floor allowance at an operating level and will be complete when the new proration plan is fully implemented.

The Board has designed its transition from the present to the new plan having general regard for the present eligibility of injection, observation and certain other non-producing wells for minimum allowances and for the terminal transfer policy. It will therefore discontinue the assignment of minimum allowances to presently qualifying injection wells after April 30, 1965, or such later date not beyond April 30, 1968, as may be determined by the Board as discussed in Section VIII.

For wells capable of production shut in for observation service or because of surplus productivity in a unit, minimum allowances equal to the sum of the lesser of the subsisting economic allowance or the physical productivity of each well, will continue to be assigned to units or schemes until April 30, 1968. To minimize the amount of well testing required the Board will establish fixed minimum allowances for the three-year period where estimates of the average productivity over the three-year period satisfactory to the Board are provided. Effective May 1, 1968, such wells will no longer qualify for an allowable and their contribution to the unit or scheme allowable will be restricted to that resulting from the inclusion of their drilling spacing units in production spacing units.

During the period, May 1, 1965, to April 30, 1968, in order to permit enjoyment at the earliest possible date of the advantages of the production spacing unit concept without sacrifice of allowable, the Board is prepared to assign to a production spacing unit a basic allowance equal to the sum of the lesser of the basic allowance or the estimated average productivity over the three-year period of each of the wells whose drilling spacing units contribute to the area of the production spacing unit. Where there is a question of productivity, the Board will require an operator to submit satisfactory estimates of average well productivity in support of an application.

Effective May 1, 1968, minimum allowances will be assigned only to producing oil wells.

Maximum Daily Rates of Production

The Board believes that some form of maximum daily rate restrictions for wells must be retained in the interests of preventing waste and agrees that the present MPR formula is not an ideal basis on which to establish such rates. The Board therefore intends to call a public hearing in the near future to receive submissions on this matter.

Transition - Implementation

The present proration plan will be continued for all pools and wells to April 30, 1965. On May 1, 1965, the basic concept of the new plan of allocation among and distribution within pools will be implemented subject, however, to important temporary modifications in order to avoid undesirable changes in pool allocation and to provide a smooth transition from the old to the new plan.

The "residual reserves" method of allocation among pools as described in Section IX will be employed for the three-year period May 1, 1965, to April 30, 1968. The basic allowance of the present proration plan also will be retained for this period, modified for wells in small oil accumulations in gas fields, discovery wells and undesignated pools. From May 1, 1968, to April 30, 1969, the "residual reserve" feature and the basic allowances will be discontinued and the provincial allowable will be allocated among pools on the basis of the greater of the pool's subsisting operating economic allowance or its share on the basis of ultimate reserves less one-half the cumulative production. On May

1, 1969, the new plan of allocation among pools will be fully implemented.

With respect to distribution within pools, and subject to the foregoing related thereto, from May 1, 1965, to April 30, 1968, each well will receive the applicable initial or operating economic allowance and a share of the residual allocation to the pool based on the area of its production spacing unit modified where appropriate by recovery factor as described in Section VIII.

From May 1, 1968, to April 30, 1969, each well will receive a share of the pool allocation on the basis of the area of its production spacing unit modified where appropriate by recovery factor as described in Section VIII, subject to a minimum floor allowance at the level of the present operating economic allowance. On May 1, 1969, the new plan of distribution among wells will be fully implemented.

Details concerning the implementation of the Board's decision concerning area allocated to wells, lease allowables and allocation of minimum allowances to non-producing wells have been discussed earlier in this Section.

Reconsideration

With respect to the level of well allowables and to the qualification for and transferability of minimum allowances, it is difficult for the Board to foresee all of the

detailed consequences during the transition period of its decisions. If the Board's intent of providing a fair and reasonable transition from the present plan to the new plan is not adequately satisfied in any particular case, the Board, on application, will reconsider the case and may give it special transition treatment.

Calgary, Alberta.

July 24, 1964.

